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Poverty, Income Inequality and Health

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TREASURY WORKING PAPER

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Poverty, Income Inequality and Health

Ken Judge
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Abstract

The purpose of this report is to consider the legitimacy of the assumption that communities or societies with more unequal income distributions have poorer health outcomes. We present a critical review of the existing international literature on the relationship between income, income inequality and health, in terms of conceptual approaches, research methods and the policy implications drawn from it. Where possible, we also offer some guidance for judging between policy priorities based on the relative importance of income inequality versus other potential causal factors in determining population levels of health. An overview of the potential relationship between income, income inequality and health is set out, followed by a discussion of the methodological and technical issues required to explore these links. A literature review of what we consider to be the key contributions in the income inequality - health debate is presented, as is a re-analysis of data derived from Chapter 3 of *Social Inequalities in Health: New Zealand 1999*, which focuses on income, income inequality and health. We conclude that the relative effect of income inequality per se as a determinant of population health has been greatly exaggerated. The frequently observed association between income inequality and health at the regional level is likely to be a by-product of the non-linear relationship between individual income and health, although we cannot dismiss the possibility that income inequality may also act as a marker for other area characteristics that influence health. We stress that a life course approach is paramount for any study into the relationship between poverty and health, while the use of multi-level data analysis is fundamental in attempting to establish the relationship between income distribution and area level health status.

JEL classification: D31 Personal income and wealth distribution; D63 Equity, justice, inequality and other normative criteria and measurements; F01 Global outlook; I18 Government policy; Regulation; Public Health

Keywords: poverty, income, income inequality, population health, health inequalities, life course studies, aggregate studies, multi-level studies

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POVERTY, INCOME INEQUALITY AND HEALTH

Chapter One: Background*

Health inequalities are endemic in modern societies. Evidence of this fact has been compiled innumerable times in many countries. But clear evidence about the factors associated with health inequalities that provides effective guidance to policymakers considering possible interventions to alleviate them is in short supply. In this situation it is important to consider any new evidence about the problem of health inequalities especially when that is accompanied by arguments about possible solutions. From this perspective, an important report – *Social Inequalities in Health: New Zealand 1999* – was produced for the Ministry of Health by the Department of Public Health, Wellington School of Medicine, University of Otago in September 2000. In her Foreword to the report, Dr Poutasi, the Director-General of the Ministry of Health in New Zealand, included the following remarks:

The report shows that in all age, gender and ethnic groups, people living in more deprived neighbourhoods have shorter life expectancy, higher rates of hospitalisation, and greater exposure to tobacco smoke than those living in less deprived neighbourhoods. This evidence supports the view that policies need to target communities as well as families and individuals. This conclusion is further reinforced by the analysis of income inequality at the health locality level, which indicates that communities with more unequal income distributions pay a price for this inequality in health terms (p. iii).

The main purpose of this report is to consider the legitimacy of this assumption about the relationship between the distribution of income and regional differences in mortality by conducting a review of the relevant literature on the links between income inequality and health outcomes, including New Zealand evidence where available.

In conducting the review, we have been asked to place particular emphasis on providing:

- a fresh, independent and critical view of the existing literature both in terms of its methods and the policy implications which have been drawn from it;

*Acknowledgements

This report represents a snapshot at one moment in time (the first half of 2001) of a very rapidly developing field. New material emerges all of the time and we are acutely conscious that some of our conclusions may be overturned by new data or innovative analysis at any time. Nevertheless, we have tried as best we can within a short space of time to try and reflect the current state of knowledge. That would not have been possible without incurring a number of debts that we are delighted to acknowledge. During the course of preparing this report we were fortunate in obtaining assistance from a number of colleagues. First, we would like to thank Des O'Dea and Phillipa Howden-Chapman for sharing their data and experience in relation to income inequality and health in New Zealand with us, and for engaging in friendly and helpful electronic conversations about issues of analysis and interpretation. Secondly, we are grateful to Tony Blakely, Angus Deaton, James Dunn, William Evans, Hugh Gravelle, Magnus Johannesson, Barbara Krimgold, Jennifer Mellor, S. V. Subramanian and David Webster for supplying us with papers and books (in progress, in press, or that we might not otherwise have seen). Thirdly, one of us was fortunate to participate in discussions with members of Working Group III (Macrosocial determinants of morbidity and mortality) at a meeting of the European Science Foundation's initiative on Social Variations in Health Expectancy in Europe *held at Dusseldorf in the spring of 2001, and we are grateful to the participants for sharing their knowledge. Finally, we are especially grateful to anonymous external referees and advisors within the New Zealand Treasury who provided very extensive and helpful comments on the first draft of this report that have helped shape the final version. Notwithstanding the very generous assistance provided by all these people we must absolve all of them for any errors of fact or interpretation that remain and for which we alone are responsible.*

- some guidance for judging between policy priorities based on the relative importance of income inequality versus other potential causal factors in determining population levels of health.

The report begins with an overview of the potential relationship between income, income inequality and health, the methods required to explore these links and the technical issues accompanying them. This is followed by a selected review of recent international literature on the relationship between income and health. Next we review the rapidly growing literature on income inequality that is dominated by studies from and about the USA. We then turn to a critical appraisal of the evidence presented in Chapter 3 of *Social Inequalities in Health: New Zealand 1999* that is concerned with income and income inequality and health. Finally, we consider the implications of the data and literature reviewed in the report for future policy development in relation to reducing health inequalities.

Our overall conclusion is that the potential role of income inequality at a regional level in relation to population health has been greatly exaggerated. Neither the New Zealand data that are presented in *Social Inequalities in Health,* nor recent findings from the international evidence, are very compelling. There are certainly grounds for believing that regional indicators of income inequality might be good markers for contextual factors associated with poor health outcomes. This is particularly likely to be the case where the local welfare state is in relatively poor shape as it is in many parts of the USA. But it is difficult to conclude that the relative importance of income inequality is that great when it is considered in the context of wider discussions about whether the characteristics of people or places are the most significant determinants of health inequalities.

Chapter Two: Conceptual and Methodological Issues

The main purpose of this report is to consider to what extent, if any, poverty/low income and income inequality per se contribute to adverse health outcomes for either individuals or populations. In chapter three, we review some of the most important studies that help to evaluate these issues. But before considering what can be learnt from empirical findings it is useful to consider a number of important conceptual and methodological issues. In particular, we consider the different reasons that have been put forward as to why income should be associated with health outcomes. We also review a number of important technical issues that have to be borne in mind in trying to establish both the direction and the strength of any relationship between income and health that might be observed in particular settings.

Income and Health

It is widely believed that there is a close association between poverty and low income and poor health outcomes even in the richer countries of the developed world. For example, Benzeval and Webb (1995) cite evidence from eight different countries in Europe, North America and Australia. One problem with existing studies, however, is that low income, poverty, manual occupational class and poor educational achievement are often treated as interchangeable phenomena. This is not a significant problem if the primary aim is to demonstrate the association between disadvantaged socio-economic circumstances and health. But if the objective is to develop an understanding of the causal nature of the relationship between socio-economic status and health one needs to be much clearer about how and why different variables are employed. It is only by doing this that one can begin to develop effective policy options to reduce health inequalities.

Against this background, we begin by outlining some of the reasons that have been given to explain the observed association between income and health. In doing this, it is clear that

issues of health selection and reverse causation - poor health leads to low income - cannot be rejected. As a result we argue that any convincing assessment of the impact of income and health has to adopt a lifecourse perspective. We also suggest that a number of technical issues have to be considered. In particular, there are four key issues that merit closer investigation:

- the measurement of income
- the shape of the relationship between income and health
- the role of health selection
- the inter-relationship between income, other measures of socio-economic status and health.

Low income leads to poor health

At a purely material level, income has an obvious impact on health insofar as it provides the means of obtaining the fundamental prerequisites for health, such as shelter, food, warmth and the ability to participate in society. Low income, therefore, increases individuals' exposure to harmful environments, such as inadequate housing, and reduces a family's ability to purchase necessities such as a healthy diet. The concomitants of poverty are often poor nutrition, overcrowding, damp and inadequately heated housing, increased risk of infections and inability to maintain standards of hygiene (Davey Smith, 1998). Poor housing, for example, is associated with respiratory illnesses, and overcrowding is linked with greater risk of fire and accidents.

Income levels also affect the way parents are able to care for their own and their children's health (Blackburn, 1991). As well as affecting where people live and where their children go to school, living on a low income makes it difficult to exercise control over family health, and as a result the health needs of parents, particularly women, are often compromised relative to those of their children. Even so, poverty reduces the ability to exercise choice over children's diet. Where money is scarce, families will buy foods that are high in calories but low in nutrition in order to satisfy their appetites (Leather, 1992). This contributes to malnutrition, high cholesterol, obesity and tooth decay among children. Furthermore, the influence of adverse socio-economic conditions in childhood, including poor diet, can accumulate throughout the lifecourse into adulthood and produce lasting increases in the risk of cardiovascular disease amongst other things.

Poverty also reinforces health-damaging behaviours. For example, the prevalence of smoking (itself an income-intensive habit) among low-income groups is often interpreted is a mechanism to cope with stress resulting from managing obligations in poor circumstances. Graham (1995) found that smoking rates in young women in manual households were related to the strains of caring responsibilities as well as to greater material disadvantages. Women considered smoking a psychological aid in equipping them to cope with caring for their children and families.

What is important is that smoking and other psychological responses to stress may have short-term benefits yet long-term health risks. In any event, 'unhealthy' behaviours need to be understood in the context of constraints on everyday life that accompany them. Furthermore, there is growing evidence that psychological demands and challenges faced in everyday life also trigger biological stress responses within the individual. These demands and challenges are met with *fight-or flight* responses, where sensory information is sent to the nervous system and hormones to prepare the brain and body to respond to the emergency. In turn, the brain and body's own reactions to these signals affect the cardiovascular and immune systems – the heart rate will rise and anxiety will increase. The

sequence of events, known as *neuroendocrine pathways*, may only provide an incidental impact on health in the short term, yet as Brunner and Marmot note:

If this biological stress response is activated too often and for too long, there may be multiple health costs. These include depression, increased susceptibility to infection, diabetes, high blood pressure, and accumulation of cholesterol in blood vessel walls, with the attendant risk of heart attack and stroke (1999, p.41).

This biological stress response will increase progressively down the social strata since 'ill health is associated with prolonged exposure to psychological demands where possibilities to control the situation are perceived to be limited and chances of reward are small' (Brunner and Marmot, 1999, p.26). While the chain between biological behaviour, the social environment, and an individual's perception of the social environment may not yet be fully understood, research evidence currently available no longer permits anyone to deny its existence (Evans et al, 1994).

Overall, there seems to be good reason for assuming that low income has a direct material bearing on ill health. At the same time, low income causes stress, which may provoke health-damaging behaviours. Furthermore, enduring stress caused by low income triggers biological processes which may also be damaging to health.

Poor health leads to low income

Most studies tend to assume that low income causes poor health for the reasons set out above. However, it is possible that health selection may be taking place, i.e. that poor health results in people's income being reduced. There are at least two types of health selection that might occur as part of the income and health relationship. First, a person in poor health might be unable to work and hence lose or leave their job and this would result in a lower income. In these circumstances, someone may describe themselves as unable to work due to ill health, unemployed, looking after the home or retired. Secondly, someone with ill health might have to take a less strenuous or stressful job or work fewer hours because of their health, which might result in a lower income. Clearly this issue is a more direct problem when wages or individual income is the variable of interest. However, even with family income, lower incomes for any individual will almost certainly lead to lower incomes for the whole family. Hence, not taking account of health selection effects may overstate the causal link between income and health.

With cross-sectional data it is impossible to identify the time sequence of events, i.e. whether a person changed their occupation or economic status before or after their change in health. Longitudinal data are required to explore this problem effectively. However, Benzeval et al (2001) suggest that it is possible to take account of these health selection effects in a very crude way, by excluding from their analyses all people who reported that they were economically inactive due to ill health. There are clearly problems with this approach even at a crude level. First, it assumes that for everyone who was economically inactive due to ill health, the direction of causation ran from poor health, to job loss, to low income. It does not take into account what caused the poor health in the first instance. On the other hand, it does not account for those people who, when they lost their job directly or indirectly as a consequence of poor health, described themselves as looking after the home, retired or unemployed. Similarly, people who may have changed their job, and hence experienced a drop in income, because of illness cannot be identified. Nevertheless, it is still useful to estimate part of the effect that health selection might have on the income and health association using this approach. For example, Benzeval et al (2001) report that excluding people who are permanently unable to work due to ill health does attenuate the strength of the relationship between income and health.

In general, our own impression is that the public health literature on health inequalities has paid too little attention to the possibility that poor health can result in reduced income. The economics literature on the other hand is much more inclined to take the view that we should not exaggerate the magnitude of one-direction causation from low income to poor health. For example, Smith (1999) was interested in the questions: 'Are healthier households wealthier ones simply because higher incomes lead to better health? Or does poor health restrict a family's capacity to earn income or to accumulate assets by limiting work or by raising medical expenses?' (p.148). Using US data from the Health and Retirement Survey, Smith found that reductions in household wealth and income do often follow the onset of ill-health. In our view, the best way of making sense of the nature, direction and strength of the relationship between income and health is to adopt a lifecourse perspective.

The importance of a lifecourse perspective

Unfortunately, much of the evidence about the association between income and health is based on cross-sectional studies, where the direction of causation cannot be known with any certainty. This is unhelpful because it is becoming increasingly clear that poverty is a dynamic not a static concept. Although some people face long periods of sustained financial hardship, a large number of others move in and out of poverty in various ways and for different periods of time. Without taking time into account it is impossible fully to appreciate the nature and experience of poverty, and equally, it is impossible to develop policies that successfully tackle the multiple causes of the problem.

Such concerns are particularly relevant to the debate about the relationship between poverty and health, as Walker and Ashworth argue:

. . . a brief spell of poverty is not the same as a lifetime spent with resources outstripped by need and . . . neither is [it] the same as repeated bouts of poverty separated by time that may allow for some financial and emotional repair. [For example,] . . . during spells of poverty psychological well-being may well reflect a complex interplay between factors that change with time: frustrated expectations and stress caused by the need to budget on an exceptionally low income for long periods, contrasting with growing expertise in what may be relatively stable financial circumstances (1994, pp.38-9).

Time, therefore, is a vital ingredient in any analysis of income or poverty and health. Three key aspects of the association over time are important.

- First, establishing the temporal order of events will increase confidence about the direction of causation in a way that is not possible with data measured at one point in time (Smith, 1999).
- Secondly, there is a growing recognition of the importance of examining people's current health in light of their life-course experience (Kuh and Ben-Shlomo, 1997). This issue may be particularly important for the association between income and health because income measured at one point in time may be a poor marker for an individual's access to material resources across their lifetime (Blundell and Preston, 1995).
- Finally, the contrasting experiences of poverty dynamics may have different consequences for health, which need to be explored.

A lifecourse perspective is equally important in attempting to establish any causal pathways from poverty in childhood to health outcomes in adulthood. Literature on the determinants of both socio-economic circumstances and health make it increasingly clear that is crucial to consider a range of factors in both childhood and adulthood. A growing number of studies demonstrate that health at middle and older ages reflects health and social conditions at early life, thus implying temporal persistence in health from early childhood to old age.

The first important study examining the sequence of early life forces impacting on adult health is the British 1946 national birth cohort study (Wadsworth and Kuh, 1997). Born in the same week of 1946, the participants were visited eight weeks after birth and have been followed up 22 times, with the most recent interview at age 51. Data were collected on a number of health characteristics and socio-economic variables including income. Events in early childhood are shown to be independent predictors of cardiovascular, respiratory and neurological health in mid-adulthood. For example, poor conditions at home during early life predict high systolic blood pressure at age 43. Development of schizophrenia by age 43 was related to difficulties in infancy in walking and talking. Another transmission path was the adoption of health behaviours either through more schooling (reduction in smoking) or as a coping mechanism for stress.

More recently, a new series of studies has investigated the role of income across the lifecourse as a determinant of adult health outcomes using birth cohort data from the National Child Development Study (NCDS) and panel data from the British Household panel Survey (BHPS). All of the studies are based on a conceptual framework that focuses on the role that income in childhood and adulthood plays in shaping health both directly and indirectly through important mediators such as educational attainment.

The conceptual framework provides a theoretical structure within which to explore issues about the direction of causation and complex inter-relations between income – and other determinants, such as employment, education and family circumstances – and health. First, an individual has certain characteristics that are fixed at birth - such as their genetic makeup, age, sex and ethnicity - which may also affect their health and socioeconomic status throughout their life. In childhood, it is particularly important to investigate the effect of the financial resources available to households on the development of health and educational capital. However, other childhood circumstances are also likely to be important factors.

Two dimensions of an individual's transition to adulthood - that are defined as 'income potential' and 'health capital' – are particularly worth highlighting:

- Income potential – is the accumulation of abilities, skills and educational experiences in childhood that are important determinants of adult employability and income capacity. Education is seen as the key mediator in this association (Kuh et al, 1997), being strongly influenced by family circumstances in childhood and a central determinant of an individual's income in adulthood.
- Health capital – is the accumulation of health resources, both physical and psychosocial, 'inherited and acquired during the early stages of life which determine current health and future health potential' (Kuh et al, 1997, p. 173).

Finally, in adulthood an individual's living standards, health-related behaviours, social networks and health are determined partly by their accumulated lifecourse experience and partly by the social roles – in terms of marital status, employment and parenthood – that they assume.

We do not want to overemphasise the significance of this particular framework, which has influenced some of our own empirical work. What we do want to argue is that it helps to illustrate the complexity of the relationship between income and health. In particular, the way that health selection and economic status reduce the significance of income for health implies that a more sophisticated conceptual framework of the relationship is required. Such a model ought to satisfy a number of requirements. For example, it would take into account the timing of events, explore some of the determinants of current income levels (economic status and education), and adopt a lifecourse perspective (suggested by the significance of

consumption factors). However, the development of such a model can only be undertaken with longitudinal data. No matter how carefully one conducts the analysis of cross-sectional data, there are limitations on the policy-related inferences that can be made. Any serious attempt in the future to identify the underlying nature of the relationship between poverty and health must adopt a lifecourse perspective. At a minimum, data are required to adjust for prior health status in advance of investigating subsequent links between income and health.

Regardless of how these existing conceptual considerations are dealt with, there are also a number of more technical issues that have to be addressed. Here we pay particular attention to three of the most important issues that demand attention:

- the measurement of income
- the functional form of the relationship between income and health
- adjusting for factors that may confound the relationship between income and health.

The measurement of income

There is little consensus in the public health literature about how best to measure income. Some studies use family income, others individual, while others limit their analysis to wages only. Some studies adjust for taxes and benefits and the composition of families, but many do not. Often, however, income is based on a self reported answer to a single banded question where it is impossible to know whether respondents are using a consistent definition.

Since the income and health literature is based on a variety of measures of income it is difficult to compare the results from one study to another. Are differences in the findings of studies real, or are they an artefact of the different ways in which income has been measured? Does the association between income and health remain when an appropriate measure of income is employed?

Social scientists are clear, however, that the most appropriate measure of income for **comparative** purposes is equivalent disposable family income (Atkinson, 1992). This means income, net of direct taxes, that is derived from all sources, such as wages, investments, benefits and pensions, for all family members. This income measure must then be weighted - or equivalised - to take account of the different size and composition of families. This is because a family of two adults and two children would need more income, but not four times as much income as a single person in order to have an equivalent standard of living.

Benzeval et al (2001) show that net equivalent family income has stronger relationships with a variety of measures of health status than income reported either for individual or gross before taxes and benefits are taken into account:

In comparison to equivalent net family income, net individual income appears to under-estimate the relative poor health of people in the lowest part of the income distribution, across the range of health measures. This is reasonably intuitive. Many people at the bottom of the distribution will have zero individual incomes. However, this does not mean that they have no material resources because they share the income available to the rest of their family. Hence using individual income can underestimate the income available to individuals to invest in their health and dilute the association between income and health.

Gross family income also appears to underestimate the poor health of people with the lowest incomes. Again, an intuitive explanation is apparent. When the income measure does not take into account the size and composition of families, single people will tend to be at the

bottom of the income distribution because they have fewer pounds in their pockets than families with multiple earners or benefit recipients. However, when family composition is taken into account single people are shown to be comparatively more affluent than families on the same income who have more people to maintain. Again the association is diluted at the bottom of the distribution by not taking this into account. (2001, p.383)

The functional form of income

Many studies investigating the income-health association also attempt to establish the exact *shape* of the relationship between income and health. The income and health relationship may take a number of forms. At its simplest, there may be a linear gradient between income and health such that for every £1 increase in income there is a unit increase in health. Alternatively there may be a threshold effect, so that income clearly affects people's health up to a specific level, beyond which the association disappears. Finally, there may be a non-linear relationship between income and health, such that at different points of the income distribution income has a different effect on health. For example, Benzeval et al (2001) have used data from the General Household Survey to examine alternative functions of the income variable, in order to assess which one best explains the relationship between income and health. The results suggest that the relationship between income and health is non-linear.

The existence of a non-linear relationship is confirmed in a number of other studies (Backlund et al, 1996; Mirowsky and Hu, 1996; Ettner, 1996; Ecob and Davey Smith, 1999), although not all analyses produce the same outcome. In a recent Finnish study, the association between net household equivalent income and self-perceived health was found to be linear among women in both Finland and Britain, although non-linear among British women when individual income was used. Among British men, the association was linear for both income measures, and for Finnish men the association was non-linear when measured by individual income but approached linearity when using household equivalent income and adjusting for other socio-economic variables (Rahkonen et al, 2000). The main finding from this study is that the association between health and income does not appear to have a threshold in the sense that only people in poverty are poorer in health than others. The shape of the association is mainly linear, health worsening on movement down the income ladder. Elsewhere, Der et al (1999) attempted to determine the relationship between household income and measures of health at different points in the lifecourse. They conclude that 'there is no single relationship between income and health but that the form of the relationship varies according to the aspect of health considered as well as by age and sex' (p.276).

On the other hand, the most compelling evidence that there is a non-linear relationship between income and health comes from the USA. Deaton (2001), for example, uses data from the National Longitudinal Mortality Survey, which linked the mortality experience over a ten-year period of more than one million people whose incomes and other personal circumstances, such as age and sex, were measured in 1980. He provides striking illustrations of the very marked non-linear relationship between income and health. One corollary of this result is that 'the effect of income on reducing the probability of death at the bottom of the income distribution….is much greater than its effect at the top of the distribution' (Deaton, 2001, p.5).

On balance, we take the view that there is a non-linear relationship between income and health and that, at the very least, any future empirical investigations should take account of the possibility that this is the case.

Confounders and the relative importance of income

It is often the case that numerous, potentially confounding, variables are included in studies that aim to explore the relationship between income and health. The rationale for the inclusion of these other factors is not always clear and the implications of multicolinearity between other variables and income on their coefficients are rarely considered. Moreover, the effect on the association between income and health is difficult to assess systematically since different studies use different combinations of variables. Unfortunately, this means that the policy inferences that can be drawn from the literature are ambiguous. A weak association between income and health may simply mean that the model has not been specified correctly or that the variables are poorly measured. The final methodological issue to consider, therefore, is the impact that different kinds of confounders have on the income and health relationship.

We are aware of number of studies that have tried to assess the relative importance of income, occupation and education for mortality (Rogot et al, 1992; Sorlie et al, 1995) and morbidity (Leigh and Fries, 1991; Hay, 1988; Winkleby et al, 1992; Dahl, 1994; Stronks, 1997), but each comes to a different conclusion.

In an analysis of Norwegian data, Dahl (1994) concludes that 'occupation status stands as the most powerful and consistent predictor of ill health among employed individuals'. Winkleby and colleagues (1992) in a study of the employed population found that 'after adjusting for age and the time of the survey education was the only measure of socioeconomic status that was significantly associated with the risk factors'. In contrast, Hay (1988) found that in an analysis of male earners: 'of the three socioeconomic measures, income was consistently the best correlate of health status'. Finally, Stronks (1997) in a study of the whole population of working age found that an income proxy resulted in the biggest change in deviance for both chronic condition and perceived general health for men and perceived general health for women. However, Stronks went on to add employment status to her models and found that this substantially reduced the coefficients on the income measures, concluding that 'the relatively strong association between income and health, relative to that between education/occupation and health, is largely due to the concentration of those with a long-term work disability in the lower income levels'. Stronks, therefore, reanalysed her data to exclude those who had a long-term work disability and found the association between income and health to be similar to that with education or occupation.

More recently Benzeval et al (2001) have used British data 'to develop an understanding of the relative importance of income and other measures of socio-economic status for health' (p.390). They report that controlling for ethnicity and social roles has little effect on the income/health relationship, but that the association between income and health began to flatten as education and occupation - and more significantly economic status and measures of consumption - are added to the models. Nonetheless, for all of the health measures except recent illness, after adjusting for a broad range of socioeconomic and demographic characteristics, people in the lower income quintiles were still significantly more likely to have poorer health than the richest fifth.

Unfortunately, since all of these studies are based on different population groups with different health outcomes and different measures of the socioeconomic variables of interest, it is difficult to draw any general conclusions from their results. At the same time it is important for both scientific and policy purposes to consider the relative importance of income and other socio-economic characteristics as determinants of health outcomes. The only way forward in our opinion is to ensure that future studies use longitudinal data in combination with explicit theoretical assumptions that lend themselves to quite specific empirical tests.

Income Inequality and Health

In recent years – especially since the mid 1990s – there has been an explosion of studies and commentaries exploring the postulated relationship between aggregate measures of income inequality and indicators of population health. But it has proved to be a somewhat controversial area with disputes about the veracity of findings and, even where they are not in dispute, lively debate about what interpretation to place on them. As Whitehead and Diderichsen (2001) have recently pointed out, 'The academic debate on the relation between income inequality, social capital, and health has become something of a minefield, with considerable skill required to tip-toe through the conflicting evidence' (p.165).

At this stage we do not want to address the question of whether or not it is possible to identify statistically significant relationships between income inequality and health. Our purpose in this chapter is to consider why and how income inequality might be associated with health. We begin by following the structure of Lynch et al's (2000a) review paper that discusses the competing interpretations of the mechanisms underlying the income inequality-health association. It largely takes as a given the existence of a relationship between income inequality and health, although it accepts that the evidence on the 'association between countries is mixed'. The main purpose of the paper is to discuss three different interpretations of the relationship and the mechanisms involved. We follow Lynch et al who begin with 'the individual income interpretation', which is essentially consistent with the absolute income hypothesis. Next they turn to 'the psychosocial environment interpretation', which is attributed to Wilkinson and his support of the relative income hypothesis. Finally, Lynch and colleagues present their own 'neo-material interpretation', which is critical of the psychosocial interpretation and argue that it is best thought of as a possible by-product of the absolute material effects brought about by a society's infrastructure. Having considered each of these arguments, which assume a negative association between income inequality and health, we also review the possibility that income inequality might have a positive impact on health outcomes.

Having discussed these various explanations, we turn our attention to various technical issues that demand consideration:

- the measurement of income inequality
- the level of aggregation that is adopted
- the need to take account of time lags.

Individual income

Although recent debate about income inequalities and health has been contentious, at one level there is every reason to expect to observe an inverse relationship between indicators of income inequality and population health at the area level. Why should this be so? The answer is a matter of simple mathematics given the existence of a non-linear relationship between income and health at the individual level. The gradient is steepest among low income groups, which means that any unit change in income should result in a bigger change in health among lower than higher income groups. This implies that any redistribution of income that favours the poor will change the average level of health because the less well-off will improve their health by a larger amount than the health of the better-off is reduced. Hence, 'at the same national income, a more equitable distribution of income among households would be expected to produce a higher average life expectancy than countries with income maldistributed' (Murray and Chen, 1996, p.149). This is a very important consideration but it carries with it certain implications about the relative importance of individual factors relative to area characteristics as determinants of health that have been

disputed. Lynch et al (2000a), for example, pay particular attention to the assumptions made by those commentators who focus on the absolute income explanation.

According to the individual income interpretation, aggregate level associations between income inequality and health reflect only the individual level association between income and health. The curvilinear relation between income and health at the individual level is a sufficient condition to produce health differences between populations with the same average income but different distributions of income. This interpretation assumes that determinants of population health are completely specified as attributes of independent individuals and that the health effects at the population level are merely sums of individual effects (Lynch et al, 2000a, p.1201).

Lynch et al cite Wolfson and colleagues (1999) in support of the belief that the individual income interpretation explains 'only a modest proportion of the observed aggregate variation in mortality at the level of the US states'. Wagstaff and van Doorslaer (2000) broadly accept this conclusion but point out that Wolfson et al 'do not further explore whether other individual or state characteristics (or fixed effects) might do so' (p.562). In a recent contribution, Gravelle (2001) has also contested the extent to which the absolute income hypothesis can be dismissed as an important part of the explanation for observed correlations between income inequalities and population health at the area level. Nevertheless, we share the view of Lynch et al and Wagstaff and van Doorslaer that it is implausible that the commonly observed area level associations between income inequality and mortality in the US are due to compositional factors alone. It is much more likely that there are 'important contextual determinants of health. To understand these potential multilevel effects, analyses are needed that use measures of income distribution and individual income to examine health differences across individuals and aggregated units'. (Lynch et al, 2000a, p.1200)

The effect of nonlinearity in the income-health relationship at individual level is plausible to the extent that it would be surprising if there was no link between income inequality and average health at area level. What is more contestable is whether or not income inequality at an area level has an *independent* effect on health after proper adjustment for the individual income and health relationship, and if it has how can that be explained. As one of the very latest contributions to this field (Subramanian et al, 2001) puts it:

The 'absolute-income' hypothesis, that higher individual income is associated with better health status, seems well-established. There is little debate about the potential benefits that higher income can bring about for improving individual health. What has gained currency in recent years, however, is the 'relative-income hypothesis'. Over and above individual income, there is postulated to be an additional impact of a society's income distribution on individuals' health. It is argued that unequal societies could have adverse consequences for individual health.

The 'relative income hypothesis' account, largely attributed to Richard Wilkinson and described in more detail below, argues that more equal societies have more social cohesion, more solidarity, less stress and, as a result, are healthier.

Psychosocial pathways

Wilkinson (1997) presents three pieces of evidence from a study of 23 OECD countries that suggest that mortality in developed countries is affected more by relative than absolute income. First, mortality is related more closely to relative income within countries than to differences in absolute income between them. Second, national mortality rates tend to be lowest in countries that have smaller income differences and thus have lower levels of relative deprivation. Third, most of the long-term rise in life expectancy seems to be unrelated to long term economic growth rates. More recently, Wilkinson (2000) has drawn

attention to two studies that also support the importance of relative income over absolute income. Data for 21 regions of Taiwan showed that, as living standards rose during the course of rapid economic growth, income inequality replaced absolute median income as the best predictor of mortality (Chiang, 1999). Furthermore, in an analysis of infant mortality in relation to income distribution and GNP per capita in three sets of data covering rich and poor countries, income distribution was more important than GNP per capita except in the poorer countries (Hales et al, 1999).

While Wilkinson has never disputed the fact that both material and social influences contribute to inequalities in health, the importance of relative standards implies that psychosocial pathways may be particularly influential. He states that:

The main material and behavioural determinants of health - diet, absolute poverty, unemployment, exercise, drug abuse, housing etc.- tend to be more widely recognized…but research increasingly suggests that many of the socio-economic determinants of health have their effects through psychosocial pathways (1999, p.257).

Wilkinson (1999) points to two important pieces of ecological (or macro-) level evidence that suggest that psychosocial pathways may exert a more powerful influence on health in the developed world than do pathways involving direct exposure to material hazards. One is through the direct psychosocial effects of low social status, and the other is through the poorer quality of social relations found in more hierarchical societies. In the first case, Wilkinson implies that 'what is important is not what your absolute level of material prosperity is, but how it compares, or where it places you, in relation to others in society' (1999, p.258). There are a number of suggestions in the psychological literature that chronic anxiety is likely to centre on feelings aroused by social comparisons. Social hierarchy induces worries about possible incompetence and inadequacy, feelings of insecurity, and fears of inferiority.

The possible centrality of shame, fears of incompetence and inferiority in relation to people in superior positions needs to be emphasized for two reasons. First, because a central part of the research task is to identify the most potent sources of recurrent anxiety related to low social status and, secondly, because these issues go beyond health: the same psychosocial processes may also contribute to a number of other social problems associated with relative deprivation (Wilkinson 1999, p.261).

Secondly, Wilkinson cites evidence that the social environment becomes less supportive and more conflictual where income differences become bigger. He notes that both Kaplan et al (1996) and Kennedy et al (1998a) have shown close relationships between homocide and income inequality. Kawachi et al (1997) have shown that the proportion of people who feel they can trust others declines sharply where income differences are bigger. Putnam's (1993) study of people's engagement in community life in the regions of Italy shows that income inequality is strongly related to his index of 'civic community'. Wilkinson (1996) himself has drawn attention to qualitative evidence suggesting that societies that were unusually egalitarian and unusually healthy were also unusually cohesive (Britain during the wars, post-war Japan, Roseto in Pennsylvania). Stansfield (1999) concludes that 'The evidence that social support is beneficial to health and that social isolation leads to ill health is now considerable. Social support has a positive effect on many different aspects of both physical and mental health' (p.155). Both House et al (1988) and Berkman (1995) report that death rates are two or three times as high among people with low levels of social integration compared to people with high levels.

Wilkinson goes on to argue that the health benefits of friendship or informal social support do not rest primarily on the practical material support it can offer; rather it is the psychosocial effect of such relations which is more important to health. He concludes that:

If increased income inequality is closely accompanied by a weakening of social bonds, the combination of the two can hardly fail to have a potent effect on health... low social status and poor social relations are probably two of the most powerful risk factors influencing population health (1999, p.262).

Neo-materialism

Lynch et al (2000a,b) set out a number of concerns about the psychosocial environment interpretation, some of which relate to what can be learnt from the empirical literature. In terms of the discussion here, their main concern appears to be the assertion that material conditions only exert weak health effects and the psychosocial effects of perceptions of relative income are more important. They note how supporters of a mainly psychosocial theory of inequalities have 'disconnected the psychological from the material, perpetuating the idea that psychological responses can be meaningfully understood as distinct from material aspects of life' (2000b, p.407). Lynch et al do not support this view, arguing that psychological responses instead reflect day to day experiences which in turn reflect material aspects of life that are politically, economically and culturally contingent.

We certainly do not deny that social inequality has psychosocial costs for individuals, or that these negative psychosocial effects are an important topic for public health. A singular focus on perceptions of 'relative income' however, can hide differences in real income, especially at the bottom of the income distribution where the greatest burden of ill health exists (2000b, p.407).

They cite the example of the richest five US metropolitan areas in 1990, where the bottom 10 per cent of the income distribution (their relative income position) was defined by an income below $12,000 per year. In the poorest five areas, the bottom 10 per cent was defined by incomes less than $4,000. The fact that the same relative income position masks large differences in real income is an important reason why Lynch et al (2000b) find it hard to accept that such absolute income differences and their implications for material standards of living are unimportant for health.

Lynch (2000) and his colleagues have consistently argued that income inequality cannot be the starting 'social fact' of a theory of health inequalities. Rather, 'the effect of income inequality on health reflects both a lack of resources held by individuals, and systematic under-investments across a wide range of community infrastructures'. Specifically:

Income inequality is but one, albeit important manifestation of a set of background historical, political, cultural and economic factors. These background factors not only produce a particular pattern of income distribution, but also create a context of community infrastructure through policies that affect education, public health services, transportation, occupational health regulations, availability of healthy food, zoning laws, pollution, housing etc (2000, p.1001).

Understanding the patterns of strategic public and private investment in what Lynch and colleagues call 'neo-material living conditions' is, in their view, likely to provide the most complete interpretation of the mechanisms between income inequality and health. Figure 1, adapted from the model presented by Lynch (2000), shows the relationships between the basic elements of the neo-material approach to understanding health inequalities at the individual and population levels.

Figure 1: A neo-material interpretation of income inequality and health

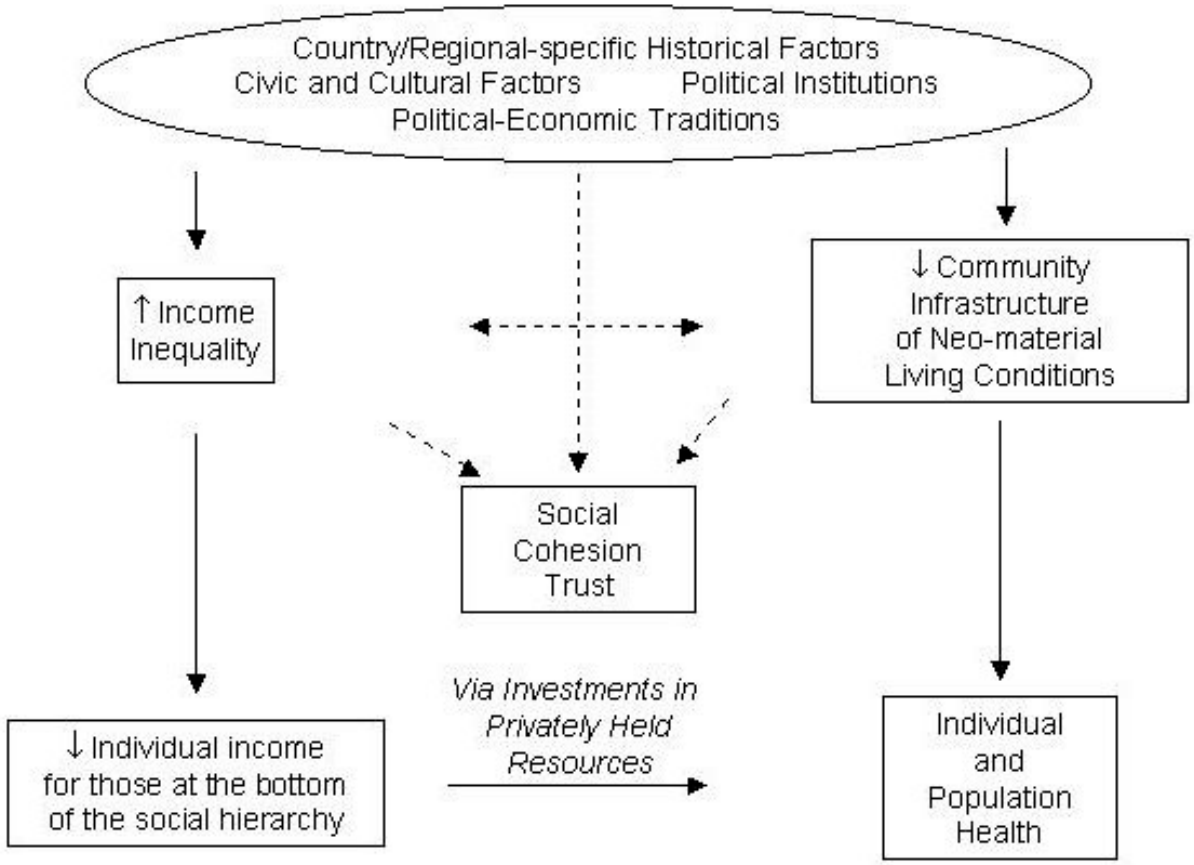


Figure 1 presents the background historical, cultural, political and economic factors which both create income inequality and, through the lack of resources held by individuals and inadequate investment, negatively impact upon the community infrastructure. It is also apparent that both pathways are detrimental to social cohesion and trust. The figure also suggests that there is no necessary observable association between income inequality and health at the aggregate level. The association between geographic variations in health and income inequality may depend upon the nature and distribution of the community infrastructure, characterised by 'neo-material living conditions'. Nevertheless, the extent of income inequality will always be directly associated with health inequalities at the individual level through its role in determining individual income and, in turn, the ability to buy health-related goods and services. This is consistent with the association established between income and health at the individual level discussed earlier.

In a reply to the criticisms of the psychosocial interpretation by Lynch and colleagues, Marmot and Wilkinson (2001) continue to produce evidence that supports the view that economic and social circumstances affect health through the physiological effects of their emotional and social meanings, not just through the direct effects of material circumstances. They do not accept that material conditions adequately explain health inequalities in rich countries on their own, but perhaps offer temporary closure on this debate by implying that both interpretations are of equal validity: 'Recognising that the socio-economic structure has powerful psychosocial as well as material effects means that it is more, not less, important to identify and tackle the structural issues' (p.1235).

Positive effects of income inequality on population health

Virtually all of the literature about the relationship between income inequality and health assumes that it is a negative one. But for completeness it is important to consider the possibility that the relationship might be a positive one. Logically there are a number of possibilities and we are grateful to one of the commentators on an earlier draft of this report for drawing these to our attention.

The first possibility is associated with technological development and associated arguments about the 'trickle down' of benefits. For example, imagine a situation where the rich are richer and the poor are poorer in country X than in country Y. It is at least possible that rich people in country X will demand more of certain types of health promoting goods and services such as new medical technologies than their counterparts in country Y. Once investments in such technologies have been made in country X then their benefits could conceivably "trickle down" to poorer people. In these circumstances, poor people in country X, that has a more unequal distribution of income, could have a comparative health advantage over their counterparts in country Y even though it has more income equality.

Another possibility is that there might be health benefits associated with income inequality through the mechanism of progressive tax structures. For example, suppose that countries X and Y are identical in all respects including the progressivity of their fiscal systems except that country X has more rich people than country Y. In these circumstances, country X could generate higher tax revenues and this might create more possibilities for spending extra taxes on public services such as education or medical care that have disproportionate health benefits for the poor in country X relative to those in country Y.

There is also an argument about psychosocial pathways that ought to be considered. For instance, if it is reasonable to suppose that the poor feel worse when they compare themselves to the rich then the opposite might be true; the rich perceive themselves to be better when compared to the poor. In this situation then income inequality would have both positive (for the rich) and negative (for the poor) effects on health. The overall effect would then depend on the relative size of the rich and poor groups and the extent of the positive or negative effects that they experience. The net effect of income inequality could be positive, negative or neutral but there is no prior reason why it would have to be negative.

No doubt there is much more that could be said about the potential nature of the relationship between income inequality and health. We have simply tried to summarise the main arguments, and we now turn to some of the critical technical issues that require attention.

Measuring income inequality

There are very substantial issues related to both the conceptualisation and the measurement of income inequality that are often overlooked (Judge et al, 1998a). In fact, in one of the best recent discussions of the issues involved, Deaton (2001) suggests that the treatment of these issues 'in the public health literature has often been cavalier' (p.35).

Three key points are perhaps worth emphasising:

- Different definitions of income inequality have quite different meanings;
- It is important to be clear about the treatment of individuals and households;
- The measurement of income inequality especially for comparative purposes is fraught with difficulty.

It does not seem to be sufficiently widely appreciated that there are many different measures of income inequality that place differential emphasis on particular parts of the distribution. For example, one commonly used measure – the Gini coefficient – is more sensitive to changes at the top of the income distribution. In contrast, indicators such as Theil measures or those based on logarithms of income are more sensitive to income inequality at the bottom of the income distribution. Deaton (2001) has illustrated the implications of such considerations in relation to some of the most commonly employed indicators of income inequality in the public health literature:

For example, the Robin Hood index … is unaffected by transfers between individuals on the same side of the mean. If a transfer program were to transfer incomes from those just below the median to those near the bottom, the Robin Hood index would not change, even though there would have been a real reduction in inequality (and very likely a decrease in mortality risk too) … most of the public health work uses as its inequality measure the share of income accruing to the bottom x (often 50) per cent of the population. Once again, transfers within the bottom x per cent, or within the top – x per cent, will leave the measure unaffected, even though such transfers are capable of having a substantial effect on income inequality more broadly (p.34).

There are also some important practical issues that ought to be considered about the measurement of household income and its attribution to individuals. For example, health is usually measured at the individual level whereas income is usually only measured at the household level. In attributing income to individuals a critical consideration becomes the basis on which this is done. The standard assumption is that household income should be 'equivalised' in some way by dividing household income by some measure of household size but there are various legitimate ways of doing this all of which might have different implications for the measurement of income inequality. There are also choices to be made about whether or not to use measures of gross or net household income. In those societies that have reasonably progressive tax systems and redistributive welfare states there are very substantial differences in the level of income inequality that is observed depending on whether or not taxes and benefits are taken into account. For example, Table 1 shows changes over time in the size of the Gini coefficient, measuring income inequality in the UK between 1977 and 1997. Inequality is very considerably greater if 'original' income is considered before the redistributive impact of taxes and benefits that yield 'disposable' income are taken into account.

Table 1: Gini coefficients for the distribution of income at each stage of the tax-benefit system (UK)

Income measure	1977	1982	1988	1993-4	1997-8
Original income	43	47	51	54	53
Disposable income	27	28	35	34	34

Source: Office for National Statistics, *Economic Trends*, April 1999, London: Stationery Office

Dealing with these issues in any circumstances can be difficult enough. But doing this in a way that permits comparisons of the distribution of income across time or space raises formidable problems. Data with which to calculate income inequality is often obtained from household surveys or tax records that have quite different strengths and weaknesses. For example, differences in survey design or the level of disaggregation of income categories or response rates can have serious implications for the extent to which comparisons are

legitimate. One illustration of the difficulties that can easily arise is provided by the authors of the most recent attempt to compile a comprehensive database of income inequality estimates across a number of years for a large number of countries. Deininger and Squire (1996) acknowledge that the estimates that they provide 'may not be fully comparable over time or across countries because of differences in how variables are defined' (p. 578).

Level of aggregation

In order to investigate any postulated relationship between income inequality and health it is first necessary to make a judgement about the group of people among whom the distribution of income should be measured. In principle, income inequality can be measured at different levels of aggregation such as the local neighbourhood, the region, the nation state or among different social groups. It is reasonable to suppose that the hypothesised effects of income inequality on individual health should vary at different levels of aggregation. Much of the literature to date is not explicit about such choices and empirical analyses appear to be driven more by the availability of data than theory. Yet, as Soobader & LeClere (1999) argue: 'the level of aggregation influences the mechanisms through which relative deprivation, class position and area effects influence health' (p.741-2). It certainly seems to be important from a policy perspective to be clear about possible effects on health of income inequality measured at different levels of aggregation. It follows, therefore, that any aggregate analysis needs to provide a rationale for the level at which income inequality is measured.

Time lags

Most existing studies of income inequality and health assume a direct, contemporaneous relationship within a fairly circumscribed time period usually a calendar year. Intuitively this seems implausible. There probably ought to be a time lag between some change in inequality and any associated change in health. Using data sampled from the 1995 and 1997 Current Population Survey in the US, Blakely et al (2000) provided a test of the potential time lags between income inequality and self rated health. Although not conclusive, the data suggested that income inequality up to 15 years previously may have been more strongly associated with self-rated health than the most recent measure of income inequality, at least for people aged 45 and older. Whether this is true or not, the issue of time lags is an important methodological concern that ought to be considered as part of any empirical investigation. Whatever assumptions are made about the temporal nature of the relationship between income inequality and health should be made explicit.

Summary

This chapter has attempted to provide an overview of some of the most important, conceptual, methodological and technical issues that arise when considering the relationships between income, income inequality and health. We cannot claim to have been exhaustive in what aims to be a brief review. Nevertheless, it is probably worth reiterating some of the main points that should be borne in mind particularly when reviewing empirical studies.

It seems reasonable to suppose that the relationship between income and health runs in two directions. In assessing the impact of income on health, therefore, it is essential to take account of health selection effects. We suggest that using longitudinal data and adopting a lifecourse perspective is the best way of doing this. But even when this is possible some important technical issues have to be considered. We draw particular attention to different approaches to the measurement of income, its functional form and its relationship with potential confounding factors. We strongly recommend that equivalised disposable household income is probably the best measure to employ, and we argue that analysts should be vigilant about the functional form of the relationship between income and health

given the balance of evidence that very poor people have especially adverse health outcomes. Having dealt with these issues it is important to concede that the relative importance of income as a significant determinant of health remains unclear because no existing studies of which we are aware have found a satisfactory way of identifying clear pathways between different characteristics of individuals that are conceptually distinct but closely correlated such as incomes, educational attainment and employment status.

In relation to income inequality and health we think it is probably best not to make assumptions about the direction of causation in advance of conducting empirical studies, although it is widely assumed that income inequality is bad for health. However, within the set of explanations that seek to provide plausible accounts of why income inequality is associated with poor health, our own view is that while psychosocial pathways are important for health, they cannot adequately explain any such relationship on their own. That stress, anxiety and other potential health hazards are promoted by an individual's perception of his or her relative position in the social hierarchy is not in doubt, but greater attention must be paid to the multiple factors that determine the location of individuals within the social strata in the first place.

In attempting to explain the relationship between income inequality and health, we believe that it is important to recognise that income distribution is driven by wider social, economic and political circumstances that also dictate the strength of a society's infrastructure in general. In turn, direct material effects – such as absolute income, welfare provision, employment opportunities and access to health care – will have a greater impact on the health of those at the bottom of the income distribution than their psychological responses to being in such a position. Therefore, in our view, the neo-material interpretation takes precedence over the psychosocial environment interpretation. We recognise that the latter is perfectly plausible but primarily in the context of, and as a product of, the former. Thus, we endorse Lynch's view that 'psychosocial and neo-material interpretations are not necessarily in conflict if psychosocial consequences of differences in neo-material living conditions are understood as precisely that – consequences of contextualised real-world living conditions' (Lynch, 2000, p.1003). Of course, competing theoretical models, or even a model that recognises compatibility of different interpretations, should be tested empirically. As described in the next chapter, there have been a couple of recent multilevel studies which pay particular attention to these competing hypotheses, by testing whether health outcomes have stronger associations with absolute or relative income measures.

Finally, we recommend that much more careful attention should be paid in the future to various technical issues. It cannot and should not be assumed that the measurement of income inequality is unproblematic. Serious consideration has to be given to the rationale for using different indicators of income inequality. Much more careful checks should be made about the comparability of data over time and space and issues related to the level of aggregation and the possibility of time lags in the postulated relationship need to be more considered more explicitly than in the past.

Chapter Three: Key Findings

It is generally accepted that poverty/low income is associated with poor health outcomes for individuals even if the pathways are not fully understood. In contrast, the claim that income inequality per se has a negative effect on health is very contentious. The review of evidence in this section of the report, therefore, focuses much more on the relationship between income inequality and health than it does on that between poverty and health. Nevertheless, we begin with a brief review of some recent evidence based on longitudinal data of one form or another that shows that there is a direct link between low income and poor health that cannot easily be explained by a process of health selection or reverse causation.

Income and Health over the Lifecourse

It is perhaps worth emphasising at the outset that there are relatively few studies that demonstrate a clear link between income and health over time having adjusted for prior health status. There is a very substantial gap in scientific knowledge in this area that merits closer attention and this is a point to which we return below. What we are able to do here is to draw attention to three pieces of knowledge that in combination add weight to our view that poverty/low income is closely associated with adverse health outcomes. First, we reproduce the findings from a recent literature review that one of us was associated with. Secondly, we summarise some of the main findings from a recent British study. Finally, we report the results of an important Swedish study that is awaiting publication.

Recent literature

Benzeval and Judge (2001) provide a convenient summary of 'what appear to be significant English-language studies' that investigate the relationship between income and health over time. Sixteen studies are included in their review if they:

- focus on adult health outcomes
- include monetary measures of income for more than one point in time
- contain a measure of income that precedes the health outcomes.

The studies identified are based on eight different longitudinal datasets from four countries: the USA, Canada, West Germany and Sweden (Elder et al, 1984; Kaplan and Haan, 1989; Hirdes and Forbes, 1989; Tahlin, 1989; Zick and Smith, 1991; Mullis, 1992; Wolfson et al, 1993; Thiede and Traub, 1997). Benzeval and Judge (2001) include a table in their paper that summarises some of the main features of each of the studies. For our purposes, we present a very brief overview of the main characteristics and results associated with the set of studies as a whole.

The surveys used for analyses of the relationship between income and health over time cover a very diverse set of populations, from a small group of women living in Berkeley in the 1930s followed until 1970 to 500,000 men registered in the Canadian Pension Plan. Most of the studies focus on specific sub-groups, in particular, men, older people, labour force participants and couples. The length of studies ranges from cross-sectional surveys with historical information on income, to a survey of families at two points in time forty years apart, to one with twenty-four consecutive years of data.

Approximately half of the study outcome measures are mortality rates. Nearly all of the remaining studies have a measure of psychosocial well-being, as well as variables based on subjective assessments of general health, lists of physical symptoms and activities of daily living.

Time has been incorporated into the income measures in a wide range of ways, which can be roughly grouped as: income level; income change; and poverty experience. Ten studies include a measure of income level, with six of these being based on long-term income. Two studies include both long-term and current income, one of which also explores individual's income level measured at a number of different points in time. Ten studies include some measure of income change. Such studies are reasonably distributed between the two change measures - loss only and any change. Seven studies include measures of both income level and income change. Six studies have a measure of poverty experience, one of which attempts to assess the stability of the occurrence as well as its duration.

The most commonly employed confounders are demographic factors and prior health status. The latter is often employed as a method of controlling for the possibility of reverse causation or health selection. Other confounders include education, employment, family characteristics, living arrangements and behaviours.

The studies employ a number of ways of controlling for health selection. First, virtually all of the studies highlight the value of using measures of income that precede the health outcomes. Secondly, many of the studies control for initial health status to take account of selection effects. Finally, a number of other studies only include in their analysis people who were in good health at the start of the survey, or stratify the sample by initial health status to identify possible selection effects.

All of the studies that include measures of income level find that it is significantly related to health outcomes. Using the various methods to control for health selection outlined above, all of the studies conclude that health selection is not a serious issue and the main direction of causation runs from income to health. There is some suggestion from the results that long-term income may be more significant for health than short-run income, although one study finds little difference. In relation to income change, people whose income falls over time, in comparison to those whose income remains stable or increases, have poorer health outcomes. Income loss appears to have a much stronger effect on health than increases in income. In the majority of studies that contain both income level and income change variables, the former appears to be more significant. Finally, persistent poverty appears to be most damaging; those people who are persistently poor, in comparison to those who experience poverty only occasionally or not at all, have the worst health outcomes.

Recent British findings

Building on the findings summarised above, one of the projects associated with the Economic and Social Research Council's *Health Variations Programme* in the UK has sought to investigate the relationship between income and self-reported health over the lifecourse using data from a birth cohort study – the National Child Development Survey (NCDS) – and the British Household Panel Survey (BHPS). The results of the project are contained in a series of recent publications (Benzeval et al, 2000; 2000b; 2000c; Benzeval and Judge, 2001) that are based on the conceptual framework described in chapter 2, but here we try to provide a succinct summary of the main findings by focussing on the main questions addressed by the ESRC project, which are set out in Box 1 below.

Box 1: Key questions about the relationship between poverty and health

- What role do financial circumstances in childhood play in shaping educational outcomes and the acquisition of health capital?
- What contribution do education and health capital make to adult health?
- What role does recent experience of income play in determining adult health after having taken account of accumulated human capital and risk?
- How does adult income interact with other adult circumstances to affect health?
- To what extent can the cross-sectional association between income and health be explained by reverse causation or health selection?
- Does the point of time at which income is measured affect the association between income and health? Is persistent poverty more harmful for health than occasional episodes?
- Do income fluctuations or volatility have an effect on health over and above income levels?
- Does the association between financial circumstances and health vary depending on whether objective monetary measures of income are considered or more subjective perceptions of financial difficulties?

What role do financial circumstances in childhood play in shaping educational outcomes and the acquisition of health capital?

Persistent financial difficulties in childhood have a significant effect on both educational attainment and health outcomes at the age of 23. Similarly there is an association between permanent parental income and these outcome measures. However, the strength of these associations is reduced when other childhood factors, in particular parental education are added to the models. Even so, the association between income and educational attainment remains significant. On the other hand, parental education is a significant determinant of family income, so it is difficult to draw any firm conclusions about the relative importance of income and education.

What contribution do education and health capital make to adult health?

Analyses of both NCDS and BHPS data suggest that education and health capital are key determinants of adult health outcomes. This is true across a range of health measures and population groups.

What role does recent experience of income play in determining adult health after having taken account of accumulated human capital and risk?

Having controlled for education, health capital and fixed factors, there are significant associations between recent income levels and fluctuations and specific health measures for particular gender and age groups. In statistical models where income fluctuations are significant, there is a greater probability of reporting ill health among those with the biggest increases in income. This result appears to be associated with factors affecting two particular groups of women. First, women over 75 whom have recently been widowed, perhaps receiving large life insurance payouts but whose health is detrimentally affected by the loss of their partner. The second group is young women under 35 who have degrees, have recently become employed and married. It may be that the strain of combining these roles has a detrimental effect on health despite the associated increases in income.

How does adult income interact with other adult circumstances to affect health? The literature suggests that many of the factors that affect an individual's income, for example, changes in employment and marital status, will also affect their health. The project team investigated the extent to which fluctuations in income associated with these life events could account for changes in health status. They found that people who separated during the first six years of the BHPS were poorer and had poorer health status before the separation than those who stayed married. However, controlling for both initial health and income change there was a significant deterioration in psychosocial health after a separation for both men and women. Similarly, men who experience unemployment during the course of the survey were poorer and had poorer health at the start of the BHPS than those in constant employment. Again, controlling for initial health and income change, people who experience unemployment had significantly poorer health at the end of the survey than those who were employed.

To what extent can the cross-sectional association between income and health be explained by reverse causation or health selection?

In the literature reverse causation has been controlled for in a number of ways, including:

- using measures of income that precede the health outcomes
- controlling for initial health in statistical models or only including people in good health at the start of the study
- using measures of income that are unrelated to the employment status of the person whose health is the focus of the study.

The project team employed all of these techniques to investigate the possibility of reverse causation. Within both NCDS and the BHPS they found that there is still a strong association between income and health when the income measure preceded the health outcome. Including initial health in the models did reduce the coefficient on the income measures suggesting that health selection does play a part in the relationship, however, it did not account for all of the association. For all of the health measures examined, individuals in the lower income quintiles or those who experienced more financial difficulties had poorer health than those respondents who were more affluent.

In addition, the team examined the association between parental income and financial circumstances in childhood and the health of the child in adulthood. They found that, in general, this was significant, although became insignificant when other factors were included in the model.

For both men and women the strongest association between adult income and health was for the general subjective assessment of health. There was also a strong association for reported limiting illness, particularly for men. In NCDS there was a strong association between income and malaise, however, this was not true for the measure of psychosocial health in BHPS – the 12 item GHQ score. The association between income and health was generally stronger for women than men, and the weakest associations were among people over retirement age.

Does the point of time at which income is measured affect the association between income and health? Is persistent poverty more harmful for health than occasional episodes?

In an analysis of BHPS the project team measured monetary income at a number of different points in time. The results showed that a stronger association existed between income and health if long-term income was employed in the models, although current income appears at least as good for the GHQ or experience of health problems. Across the health measures,

population groups and surveys, persistent poverty was more harmful for health than occasional episodes.

Do income fluctuations or volatility have an effect on health over and above income levels?

There is a negative association between the extent of income change and reporting poor health. The larger the fall in income the more likely people are to report poor health. If one allows the association to be non-linear, falls in income appear to have a harmful effect on health but equivalent increases in income do not have a significant effect. This may be the result of the operation of different time lags and needs further investigation. Income volatility is significantly associated with both subjective assessments of health and the GHQ, with people who experience more volatile incomes having better health.

Does the association between financial circumstances and health vary depending on whether objective monetary measures of income are considered or more subjective perceptions of financial circumstances?

Across all health measures and population groups there appears to be a stronger and steeper association between subjective assessments of financial difficulty and health than exists for monetary measures of income. This may simply be the result of negativity i.e. people who report negative experiences in one domain of their lives are more likely to do so in others. Alternatively, however, it may be that it is the gap between resources and needs that is important for health, and perceptions of financial difficulties may be a better proxy for this than actual monetary income.

New Swedish Data

The final piece of evidence particularly worth highlighting is a new study from Sweden that has an important contribution to make to debates about the relationship of both poverty and income inequality to health. Here we focus on the findings in relation to low income and health. But it is convenient to describe the study as a whole here; we return to the other findings in the next section of this chapter

Gerdtham and Johannesson (2001) attempt to estimate the effect of absolute income, relative income and income inequality on the risk of mortality. In order to do this they estimate mortality risk as a function of individual income, community income and community-income inequality, with the community being defined as the municipality (n=284) of the individual. Estimates of the effects of income and income inequality on mortality are also adjusted by controlling for initial health status in order to avoid the reverse causality problem between income and health, and by controlling for age, gender, unemployment, level of education, immigration, urbanisation, marital status and the number of children. Box-Cox analysis is used to find the optimal functional relationship between income and the mortality rate, and a number of measurement and specification issues are explored to test sensitivity, such as using alternative definitions of income and income inequality, instrumental variables, and alternative estimation techniques. Furthermore, analysis is undertaken on the possible interaction effects between income and gender and between income and age.

The analyses are based on mortality follow-up data that were linked to a random sample of the adult Swedish population aged 20-84 years (N = 40,000+) who participated in Statistic Sweden's Survey of Living Conditions (ULF) conducted between 1980- 1986.

The main results show that individual income is highly significant with a negative sign. The relationship between annual individual income and the one-year mortality risk was highly non-linear with a decreasing effect of income at higher income levels. Another important result shows the importance of controlling for initial health status. This was demonstrated very clearly in the Swedish study, where the income coefficient increased by about 60 per

cent if initial health status was not controlled for. Excluding information about educational level also tended to exaggerate the impact of income. Nevertheless, there is no doubt that the non-linear and inverse relationship between income and health is robust to a wide range of sensitivity analyses.

Overall assessment

It seems reasonably clear that studies using longitudinal data and that control for initial health status do show that a relationship exists between low income and adverse health outcomes. This finding appears consistently in studies using good-quality data from a wide range of countries. However, such results are not terribly helpful for policy purposes. It seems reasonable to suppose that anti-poverty measures might have beneficial health consequences, but not a single study exists that can state with any conviction what the health gain and its distribution might be. In general it is impossible to tell from even the best studies what is the relative importance of poverty or low income in relation to other characteristics of individuals and the environments in which they live. This is of enormous practical and scientific importance. A recent review by Deaton (2001) agrees that poverty is implicated in the production of health inequalities but argues that the precise nature and strength of the relationship is not clearly understood:

… the urgent need is to refocus research to investigate the role that income plays in promoting health. We need to know much more than we do about whether the effects of income come from income itself, or correlates, such as education, wealth, control, or rank (p. 61).

In our view, this is a hugely important research priority that demands much more attention in the future.

Income Inequality and Population Health

Given the very large amount of literature produced in recent years it would be a very daunting task to carefully review every contribution in an attempt to glean what can be learnt about the relationship between income inequality and health. Fortunately, three excellent reviews by outstanding international experts have appeared since the beginning of the year 2000. Wagstaff and van Doorslaer (2000) focus mainly on whether or not the empirical evidence to date allows judgements to be made about the validity of competing hypotheses that seek to account for observed relationships between income inequality and health. Deaton (2001) also explores the theoretical and empirical basis for a connection between inequality and health. He is concerned with poor as well as rich countries, although we will concentrate on his analysis of studies in the developed world for our purposes here. Between them, and the theoretical literature review by Lynch et al (2000a), 18 core papers on income inequality and health have been identified (see Box 2) in common that might be thought of as representing most if not all of the key contributions to the debate by the close of 1999 *. Both empirical reviews cite other useful references but with minor exceptions a failure to consider them would not limit what can be learnt from the literature to date. Some of the main differences in the literature cited in the two empirical studies are set out below.

- Wagstaff and van Doorslaer cite many more pre-Wilkinson (1992) historical references and a number of technical references.

* The paper by Rodgers (1979) is not cited by Lynch et al (2000) but it is one of the seminal papers in this area and so we have included it in this group.

- Deaton cites 11 references from 2000 and 2001 that are not featured in Wagstaff and Van Doorslaer's review and cites more references from his own work that elaborate on points made in the literature cited in common.
- Wagstaff and Van Doorslaer's review is structured with the sole focus on establishing the relationship between income inequality and health, while Deaton locates his review in the context of more general international comparisons of health and economic development.

The key assumption that we want to make is that most of what it is valuable to learn from the literature up to the year 2001 is contained in the two reviews by Wagstaff and van Doorslaer (2000) and Deaton (2001). This section of the report therefore draws heavily on these two reviews and it is supplemented by evidence obtained from what appear to be the most important studies published or in press since the completion of the latter.

Box 2: Core papers on income inequality and health

Rodgers (1979)
Flegg (1982)
Waldmann (1992)
Wilkinson (1992)
Wilkinson (1994)
Judge (1995)
Kaplan et al (1996)
Wilkinson (1996)
Kennedy, Kawachi and Prothrow-Stith (1996)
Kawachi and Kennedy (1997)
Fiscella and Franks (1997)
Lynch, Kaplan, Pamuk, Cohen, Heck et al (1998)
Kennedy et al (1998b)
Daly et al (1998)
Judge et al (1998a)
Soobader and LeClere (1999)
Wolfson et al (1999)
Mellor and Milyo (1999/2001a)

The evidence

Our review of the evidence about the relationship between income inequality and health is organised in two sections. The first considers aggregated studies and the second focuses on the latest generation of papers that make use of individual level data in multi-level analyses. Where it is appropriate we make references to some of the core papers listed in Box 2, although we also rely heavily on Wagstaff and Van Doorslaer and Deaton. Our main focus is on the latest papers that add to or confirm the findings noted by the two earlier empirical reviews.

A number of new empirical contributions have become available since Wagstaff and Van Doorslaer (2000) completed the work for their review. Some of these have already appeared in print (and are cited by Deaton (2001)) but many are awaiting publication, being reviewed

by journals or are simply working papers subject to further revision. We cannot pretend to have unearthed all relevant contributions that have been produced in the past year or so but we do believe that, with the help of other colleagues, we have identified several that are worth highlighting in the context of this review. One or two of the papers that we have chosen to review were identified by either Wagstaff and Van Doorslaer (2000) or Deaton (2001) but most of them postdate both of those reviews.

Aggregated studies

Cross-country studies have played an important part in the literature on income inequality and health. Preston (1975) looked at international patterns of GDP and life expectancy, and it was on the basis of his findings – a non-linear relationship between income per head and life expectancy – that he suggested that there should be a negative relationship between income inequality and health. Following on, Rodgers (1979) used the Pauket (1973) data for 56 countries and, controlling for income and other variables, found hazardous effects of inequality on life expectancy at birth, life expectancy at age 5, and on the rate of infant mortality in developed countries. Flegg (1982) also found significant effects of income inequality on child mortality in developing countries using data from Jain (1975). Using the same data, Waldmann (1992) demonstrated a direct effect of income inequality on child mortality at the microeconomic level. He found that, conditional on mean income, the share of income going to the poorest 20 per cent of the population decreased infant mortality, but the share of income going to the top 5 per cent increased infant mortality.

Perhaps the single most commonly-cited finding in the literature on income inequality and health up until the late 1990s was Wilkinson's (1992, 1994, 1996) demonstration of a relationship between income inequality and life expectancy across a number of industrialised countries, not only in levels, but in changes over time. Countries such as France and Greece, that narrowed their income distributions increased their life expectancies, while those, such as the UK and Ireland, whose income distributions widened, fell behind (Wilkinson, 1996). It was these findings that prompted Wilkinson to argue that relative income, not absolute income, mattered for population health.

Recent research has cast considerable doubt on the robustness and reliability of many of the findings of Wilkinson, Flegg, Waldmann and others, with one of the main difficulties lying in the unreliability of the data on income inequality (Judge, 1995; Judge et al, 1998a). For example, Mellor and Milyo (2001b) review past studies of, and use new data to explore, aggregate level associations between income inequality and health across both countries and US states. The thrust of their approach is captured by the statement that:

… the evidence of an association between inequality and health is more limited and mixed than is typically acknowledged. Consequently, the income inequality hypothesis, though intriguing, hardly warrants an exuberant embrace.

Mellor & Milyo (2001b) estimate a large number of equations for countries and US states using different measures of health for different years in various different ways. They also attempt to deal with problems associated with confounding and omitted variable bias by including controls such as average income and levels of education and by focusing attention on analyses of first-level differences in the variable of primary interest. They conclude unambiguously that the postulated relationship between income inequality and population health is far from robust as is too often claimed. In fact, Mellor and Milyo argue that their 'findings are also consistent with several recent studies that use individual level data; rather than a robust association between inequality and health, results tend to be all over the map'. In our view this is not the most significant recent contribution to this subject from a methodological point of view. The country-level data on income inequality, for example, have been criticised on comparability grounds (Judge et al, 1998b). But it is a very important

corrective to many of the papers that have captured public and professional attention since the mid-1990s. The conclusion to this study is one that in our view ought to be much more widely heard and accepted.

Contrary to the claims of previous researchers, there is no strong empirical support for the contention that inequality is a determinant of population health, let alone one of the most important determinants.

The most recent cross-country study has assessed the associations between income inequality and a number of health outcomes in 16 developed countries between 1989 and 1992 (Lynch et al, 2001). Contrary to the earlier literature, one of the most important findings is that 'Income inequality was not related to life expectancy differences' (p.196). Other results indicated that higher income inequality was strongly associated with greater mortality among infants, but the subsequent exclusion of the USA data substantially diminished the association. Following similar exclusion, the same occurred with the associations between income inequality and low birth-weight, infectious diseases, homocide and unintentional injury. Across the complete sample, income inequality was inconsistently associated with specific cause of deaths; there was no association with CHD, breast or prostate cancer, cirrhosis or diabetes. It was only moderately associated with poor self-rated health.

As scepticism has grown about the international relationship between income inequality and health, attention has switched to studies within countries, particularly of mortality and income inequality across states of the US (Kaplan et al 1996; Kennedy, Kawachi and Prothrow-Stith 1996; Kawachi and Kennedy 1997; Lynch et al 1998). Income inequality is usually measured from income collected in the census, which is administered to households in all states in universal fashion, thus within-country studies do not suffer from the same data problems as do international comparisons. All such major studies also show the existence of an undeniable correlation between income inequality and mortality at state level. However, more recent studies may allow us to identify whether or not this relationship comes from the effects of income inequality or some other factor that is correlated with it. For example, Woodward and Kawachi (2000) point out that:

In the US, wide inequalities in income at the state level tend to go along with lower than average expenditure in human capital (for example through spending on public education), and this is reflected in outcomes such as lower literacy and higher school drop out rates that will ultimately disadvantage society as a whole (p. 925).

Interestingly this point closely corresponds with that made by Judge et al (1998b) who pointed out that although there can be no doubt about the existence 'of an association between income inequality and mortality among US states … it is increasingly recognised that many other characteristics of US states which reflect the profound social inequality within the USA are also associated with variations in mortality' (p. 984). Table 2, which is taken from Judge et al (1998b), shows that many of these characteristics – especially ethnicity and educational attainment – have stronger associations with mortality than income inequality. For example, the importance of race in relation to income inequality and health has been highlighted in a new study that investigates the robustness of the connection between income inequality and mortality across states and Metropolitan Statistical Areas within the USA, with particular attention to the effects of race as a potential confounder.

Table 2. Regional variations in mortality and social indicators: United States, 1990-92*

(Pearson correlation coefficients)

Social indicators		All cause mortality Female	Male	Infant
GINI[1]	0.4651	P = 0.001 0.5651	P = 0.000 0.4031	P = 0.004
POVERTY[2]	0.4022	P = 0.004 0.6101	P = 0.000 0.5354	P = 0.000
BLACKPC[3]	0.7036	P = 0.000 0.7951	P = 0.000 0.8077	P = 0.000
UNEMP91[4]	0.5456	P = 0.000 0.4669	P = 0.001 0.1829	P = 0.204
FEMPRT91[5]	0.4977	P = 0.000-0.5739	P = 0.000-0.4098	P = 0.002
PUBLIC[6]	0.5253	P = 0.000 0.5939	P = 0.000 0.4093	P = 0.003
EDUCAT[7]	0.6286	P = 0.000-0.8236	P = 0.000-0.6371	P = 0.000
SMOKING[8]	0.5649	P = 0.000 0.5625	P = 0.000 0.3995	P = 0.004
FOOD[9]	0.5148	P = 0.000 0.6234	P = 0.000 0.4397	P = 0.001

[1] Gini coefficient (1990-92)
[2] Proportion of households below national poverty level (1990)
[3] Proportion of the population who are black (1990-92)
[4] Unemployment rate (1991)
[5] Female participation rate (1991)
[6] Proportion of the population who receive public aid (1990)
[7] Proportion of the population aged over 25 who graduated from high school (1990)
[8] Proportion of the population who smoke (1992-93)
[9] Proportion of the population who receive food stamps (1991)

Deaton and Lubotsky (2001) show that, once they control for the fraction of the population that is black, there is no relationship between income inequality and mortality across either states or cities. This result does not come from the pooling of black and white mortality as the correlation between income inequality and mortality is present for each race separately. Instead, the results arise from the fact that white mortality rates are higher in places where a higher fraction of the population is black.

Cross-section regressions across American states and cities show that, conditional on racial composition, income inequality does not raise the risk of mortality. The fraction of the population that is black is a significant risk-factor for mortality, not only for the population as a whole- which would follow mechanically from the fact that blacks have higher mortality rates than whites-but for both blacks and whites separately (p.17).

In regressions containing both the fraction black and income inequality, the former drives out the latter so that, even if it is not clear exactly what it is about a high fraction black that drives the mortality results, it is not the associated income inequality. Deaton and Lubotsky (2001) explore other potentially confounding variables in order to learn something about the mechanisms that might be driving this result. The relationship between the fraction black and white mortality holds within broad geographical regions, and so is not driven by a comparison of the South with the rest of the country. The correlation is also robust to the inclusion of controls for state fixed effects and for education, holds for nearly all age groups and for males and females, and cannot readily be attributed to variations in local health provision.

Beyond the USA

Most of the recent literature on income inequality and health and nearly of the methodological advances are based on data about the USA. Given the extremes of inequality experienced in that country this poses a problem in trying to understand whether there is anything generalisable about the relationship between income inequality and health where it is observed. It is perfectly possible that it may be a phenomenon that if it exists anywhere is especially problematic in the USA. From this perspective it is important to note that a small number of papers have begun to emerge that help to strengthen the case for the

neo-materialistic interpretation by emphasising the role of other contextual factors – such as the nature of the local welfare state – as determinants of health.

Perhaps the most interesting aggregate-level paper to date that goes beyond the USA compares the relationships between median income, income inequality and age adjusted mortality in 10 Canadian provinces and 50 US states and 53 Canadian and 282 US metropolitan settings with populations greater than 50,000 (Ross et al, 2000). Data on income inequality are measured as the total share of income available to the bottom 50 per cent of the distribution in 1990 in the US and in 1991 in Canada. Age adjusted mortality data cover the period 1989-91 in the US and 1990-92 in Canada. Results are calculated for various combinations of age and gender categories.

From our point of view, the study does not add anything methodologically since it does not have individual level data. Having said that, the results show that income inequality is associated with variations in mortality in the US but not in Canada: 'There were no significant associations between income inequality and mortality in Canada at either the provincial or metropolitan area levels, whereas such associations were apparent in the United States' (p.900)

The really interesting question is why this should be so. Ross et al (2000) suggest two possibilities. One is that the relationship between income inequality and mortality is non-linear so that at lower levels of inequality there is less impact on health. Another possibility is that the relationship between income inequality and mortality should not be conceived of as a universal one but rather that its potential impact depends on the configuration of social and political characteristics in particular jurisdictions. Ross et al (2000) themselves suggest that:

One plausible difference is the greater degree of economic segregation in large US cities. Such segregation can create a spatial mismatch between workers and jobs and large inequalities in provision of public goods and services (for example, schools, transportation, health care, policing, housing, etc) because of concentrations of people with high social needs in municipalities with low tax bases … Another major difference between the two countries is the way in which resources such as health care and high quality education are distributed … As a consequence, in the United States an individual's income, in both a relative and absolute sense, is a much stronger determinant of life chances and, in turn, "health chances" than in Canada (p.901).

A forthcoming paper by Dunn (2001) provides further elaboration of these concluding arguments. Dunn argues that the paper by Ross et al (2000) 'shows that the relationship between income inequality and population health … is neither simple nor ubiquitous', and he explores 'some of the possible explanatory pathways that could account for … the difference between Canada and the U.S. in the relationship between income inequality and population health'. He pays particular attention to major differences between the two nations:

- in the availability of publicly-funded services such as education and health care
- in the degree of socio-economic segregation in metropolitan areas
- in the nature of governance structures and fiscal systems.

The net result, Dunn observes, is that in the US by comparison with Canada, an atomistic mixture of economic, political and social characteristics combine to create 'a considerable patchwork of inequitable services and public goods across the urban landscape … (that) constitutes a fundamental crisis of collective production … producing vast differences in the quality of everyday life'.

Reflecting on these observations it is perhaps not surprising that so much of the recent literature and most of the data analysis about the relationship between income inequality and population health springs from the USA, because inequality and a deep-rooted suspicion of collective forms of welfare are so endemic in that society. But that makes it even more important not to generalise from that experience to other western societies that have much more fully developed welfare states. For example, in a simple cross-national comparison of the relationship between income inequality and infant mortality, Judge et al (1998a) have shown the very considerable degree to which the USA is an extreme outlier, and this finding is confirmed by Lynch et al (2001). One important implication of the probability that the USA is an extreme example is that well-conducted studies of the relationship between income inequality and population health within and between different kinds of Welfare States are badly needed.

Studies using individual-level data

There is now a growing recognition of the need to explore the relationship between income, income inequality and health by teasing out the distinctions between the compositional and the contextual determinants of health by using multilevel statistical models. For example, Joshi and colleagues (2000) explain that:

Research on the reasons for observed area differences now distinguishes between the effects of social composition and of social context … Composition refers to the aggregated characteristics of individuals living in an area, while context refers to characteristics of the area which are independent of its individual inhabitants. Context could include features of the physical environment, such as climate or pollution, and features of the local economy, such as the housing stock or the structure of employment. It could also include the provision of services such as shops, transport and schools, as well as the quality of healthcare available. Finally, there are features of the social fabric which may make a place less or more "healthy", such as the level of crime or community cohesion (p. 144).

Studies using individual level data therefore have the advantage of being able to look at the direct effect of income inequality without having to handle the effects of inequality that work through aggregation. This section reviews a number of important new studies from the last two years. We focus on five studies from the USA and two from Europe.

US data

LeClere and Soobader (2000) assessed whether the effects of income inequality on health are consistent across demographic subgroups of the US population. Individual health and socio-economic data from the National Health Interview Survey were linked to county/level measures of income inequality to assess the effect of county level income inequality on the self-reported health of Whites and Blacks in 3 age groups. Measures of family income at the time of interview and other measures of individual and county characteristics were included. The analysis was stratified by the 6 age and race/ethnicity groups to provide insight into the link between income inequality, racial/ethnic residential segregation, and poverty concentration in the United States.

Data from the NHIS were concatenated for three consecutive years, 1989 through 1991, and were supplemented with information from the 1990 census. Individual records from the NHIS were linked to census data with county Federal Information Processing Standards (FIPS) codes, which uniquely identified the county. Six race/ethnicity and age groups were analysed separately – White and Black non-Hispanics in 3 age groups – to demonstrate that both income inequality and other characteristics of the place of residence have substantially different effects by race/ethnicity and age.

Morbidity was the focus of this study because, as mortality rates level off and chronic diseases become more prominent, it is thought to be a more salient measure of the health response to social inequality. Of all morbidity indicators, perceived health has been shown to be the strongest predictor of mortality, and in this analysis, the 5-point scale in the NHIS was dichotomized into those in fair or poor health and those who rated their health as good, very good, or excellent. Two variables were used at county level from the 1990 census and attached to the individual records from the NHIS: the percentage of county households with incomes under the official US poverty threshold for each survey year, and the Gini index.

The results of the multilevel analyses, in which individual family income and county-level poverty rates were included, were not consistent with existing research. In the presence of covariates, the conditional effects of inequality were restricted to Whites aged 18-44 years in the 2 highest income inequality quartiles and middle-aged Whites counties with the highest level of income inequality. The health of Blacks of all ages, elderly Whites, and middle-aged Whites outside the areas of highest inequality was unaffected when controls for individual characteristics and county-level poverty were in place. LeClere and Soobader (2000) conclude that:

For the US at least, it is clear that when individual income and county income levels are controlled for, the independent and direct contribution of income inequality to the determination of self-perceived health is restricted to some demographic groups. It is also apparent that different pathways from income inequality to health exist for other groups. Results suggest that caution is warranted when population-level mechanisms are posited to explain the more limited effect of relative income distributions on the health outcomes of individuals. Consequently, future attempts to explore the effects of income inequality on adult morbidity or mortality in the US must address the influence of demographic and geographic variability (p.1897).

The aim of a paper by Lochner et al (2001), recently published in the *American Journal of Public Health*, is to investigate 'the relationship between state-level income inequality and mortality risk, after accounting for income as well as other sociodemographic characteristics of individuals' and 'to identify which socio-economic groups may be most affected by living in a state with high levels of income inequality' (pp. 385-6).

The analysis is based on data from three sources. Individual level data about personal circumstances were obtained from the National Health Interview Survey (NHIS). Information about the characteristics of States where NHIS respondents lived was obtained from the US Bureau of the Census. Mortality data were obtained from the National Death Index. Data from these different sources were linked.

The aim was to use state and individual level variables to predict age-adjusted death rates for non-Hispanic Whites and Blacks separately and as a combined group for people aged 18-74 at baseline. The state level predictor variables comprised a five-category indicator of income inequality and a continuous measure of the proportion of residents below the poverty threshold. At the individual level the variables were age, sex, race/ethnicity, marital status and annual income.

A number of complicated adjustments to various measures of income and income inequality are explained but it is not immediately clear what impact all of these make to the complex pattern of results that are reported. Nevertheless, the authors conclude that their 'findings demonstrate a contextual effect of state income inequality on individual mortality risk after state poverty levels and individual sociodemographic characteristics are controlled for' (p. 389), although they also note that 'the contextual effect of state income inequality on mortality may appear modest compared with the effect of individual-level income' (p. 390).

In an accompanying editorial Kaplan and Lynch (2001) commend the paper by Lochner et al (2001) as one that makes a useful contribution 'by documenting an increased risk of death among individuals in some groups living in high-inequality vs low-inequality states' (p. 351). However, after reviewing some of the more significant conceptual and methodological issues that have arisen in relation to income inequality and health they repeat an important point that they have made on previous occasions.

It may well be that the impact of income inequality on health is not automatic but varies as a function of the institutional and societal arrangements that buffer the impact of income inequality on health (p. 352).

Subramanian et al (2001) provide an interesting and useful addition to the literature by combining individual level data about income and health with state level information about income inequality and social capital and then using multilevel statistical procedures.

The paper uses US data for 144,692 adult individuals and 39 States from the late 1980s and early 1990s to identify individual and area level factors associated with subjective health status, which is analysed as a dichotomous variable distinguishing between fair/poor health on the one hand and excellent/very good/good on the other. A number of potential determinants of health are considered in the analysis. At the individual level information is available about age, gender, race, income, health care coverage, health check up in the last year, smoking and marital status. The state level variables are per capita median income, the Gini coefficient on income inequality and a measure of social capital – or more specifically distrust - that was available for only 39 of the 50 states and that was operationalised as the percentage of residents in each state who agreed that 'other people would try to take advantage of you if they could'.

The paper concludes that all of the individual level determinants of health are statistically significantly associated with subjective health status. Such findings in themselves are neither new nor surprising but where the paper does break new ground is in demonstrating that even after adjusting for individual-level determinants significant variation between states remains that is associated with identifiable factors. The results show that median income and levels of mistrust are statistically significantly associated with poor health after adjusting for individual level factors. However, the findings on income inequality are more mixed. The Gini coefficient is not significant. The best that can be said is that: 'While not strong, there seems to be a differential impact of state income-inequality on high-income groups, such that the affluent report better health from living in high inequality states'.

Our view is that although this paper makes an important contribution it does have certain weaknesses. One is that individual income is measured rather crudely. As the authors acknowledge: 'by specifying only three income categories some of the finer relationships between income and self-rated health may remain obscured'. Another rather more important problem in our view is the failure to include a wider range of state level characteristics that would reflect arguments from the neo-material perspective in the random part of their statistical models. Nevertheless, even as it stands the paper is important in suggesting that individual levels of income and average levels of income within a state that 'captures the overall affluence in a society' are much more significant than income inequality. In this sense the paper provides empirical verification of the conclusions reached by Wagstaff and van Doorslaer (2000).

In another paper from the Harvard stable, Blakely et al (2001) examine the relationship between income inequality measured at the metropolitan and county level in the USA with individual self-rated health after adjusting for a number of individual characteristics including household income. Data for individuals were obtained from the Current Population Survey

(CPS) in 1996 and 1998, and the final sample included information about 185,479 respondents in 232 metropolitan areas (MAs). Area level data about average household income and income inequality were taken from the 1990 Census for 50 US states excluding Washington DC. Multilevel logistic regression models were estimated using these data.

The main findings from this study are that there are no statistically significant associations between income inequality in different types of metropolitan area and self-rated subjective health status for individuals after having adjusted for age, sex, race, actual household income and average household income. As a result the authors conclude that: 'our results suggest little (if any) association of MA-level income inequality with fair/health self-rated health' (p. 25). But much hinges on whether or not it is appropriate to adjust for individual-level income before estimating the effects of income inequality. So, for example, Blakeley et al (2001) suggest that from one perspective it is possible to argue that: 'adjusting for individual income underestimates the real impact of income inequality by over-controlling for the consequences of income inequality that works through the non-linear association of individual income with poor health'. Blakeley et al themselves do not take a firm view about this possibility and they end their paper with what appears to be the incontrovertible statement that:

What may be definitely concluded from this study is that, for CPS respondents in 1996 and 1990 at least, there is little association of MA-level income inequality with fair/poor health: a) after controlling by MA-average income, and b) by pathways other than income itself at the individual level (authors' emphasis).

A slightly different multilevel perspective to that offered by the three Harvard studies is provided by Mellor and Milyo (1999/2001a) in a paper currently being reviewed for publication and that was cited in an earlier version by Wagstaff and van Doorslaer (2000). Like Blakely et al (2001) Mellor and Milyo use data from the CPS with a focus on self-reported fair/poor health status. They have combined data to provide a total sample of 309,135 respondents between 1995 and 1999 for state level analysis and 216,572 for MA level tests because MAs with fewer than 50 respondents are excluded from the statistical models.

The aim of the study is to 'employ data on self-reported health status for a large sample of individuals to examine whether the frequently observed correlation between income inequality and aggregate health is the product of an ecological fallacy or omitted variable bias'. Individual level data employed in the analyses employed include age, sex, ethnicity, marital status, health insurance coverage and educational level. Income inequality measures include the coefficient of variation, the P90/P10 ratio and the share of income going to the top 50 per cent of households.

As Mellor & Milyo estimate average income and measures of income inequality directly from CPS data – for which they have been criticised by Blakely et al (2001) – they report that it 'is necessary to first demonstrate that our data yield results similar to those found in previous ecological-level analyses', which they do. They then use multilevel probit models to test both the strong and the weak version of the income inequality hypothesis (IIH), which they define in the following way: 'inequality may be a public bad for all members of a society (strong IIH), or it may afflict only the least well off in society (weak IIH)'.

The general pattern of multilevel statistical results reported is very clear. Initially there appears to be a strong and statistically significant association between income inequality and health but this is substantially attenuated when data about individual characteristics of respondents are added and further reduced when additional area level variables are included. As a result Mellor & Milyo (1999/2001a) suggest that the reasons why previous studies have reported an association between income inequality and health 'are partly the

product of an ecological fallacy and partly attributable to the failure to control for individual covariates, year effects, and geographic characteristics'. Their own conclusions are summarised as follows:

… we find no consistent evidence of an association between state-level and metro-level income inequality and the health status of all individuals (strong IIH), and no consistent evidence that inequality has its strongest impact on the health of the poor (weak IIH).

European data

Moving away from North America altogether, it is worth mentioning an interesting study using British data that has been published recently (Weich et al, 2001). The aim of this paper is 'to test the hypothesis that individuals in regions of Britain with the highest income inequality have a higher prevalence of the common mental disorders after adjusting for individual income' (p. 222).

Data were obtained from the first wave of the BHPS in 1991 and included all adult respondents (N=8191) who completed the 12 item GHQ, which is 'a measure of recent changes in one's usual mental state' (p. 222). Information was also obtained about equivalised household income and measures of average income (median net income) and income inequality (the Gini coefficient) were calculated for the region of residence of each BHPS respondent. Data about age, gender, social class, marital status, education, employment, ethnicity and the number of current health problems reported by each BHPS respondent were also employed in the analyses.

A particular variant of logistic regression was employed to assess the impact of income inequality on GHQ status after adjustment for a number of possible confounders including individual and average regional income.

Since data were clustered within both households and regions, we adjusted the standard errors of regression coefficients using the Huber-White sandwich estimate of variance … This method relaxes the assumption of independence within clusters … (and) corrects standard errors for any clustering of data (p. 223).

The findings show 'that the most affluent individuals living in areas of highest income inequality experience worse psychosocial health … than their counterparts in regions where income is distributed more equally' (p. 226). These results are somewhat surprising and taken at face value they do provide some support for the income inequality hypothesis. But the two regions with the highest income inequality are inner and outer London and this opens up the possibility that high levels of income inequality in the capital may be reflecting other characteristics of the area that are directly related to poor mental health. Weich et al (2001) recognise this and suggest that:

… the stresses experienced by those with the highest incomes may be greater in London than elsewhere because of transport difficulties or higher crime rates. Similarly, the difficulties of life on a low income may be eased in London by greater access to social housing, public transport and other amenities (p. 226).

There are probably two aspects of this particular study that are worth highlighting. The first is that it provides further evidence that when analyses are based on combining individual and area-level data the supposedly robust relationship between income inequality and health is greatly weakened, confused or non-existent. The second point is that although Weich et al (2001) have not taken advantage of it themselves their paper does point the way in highlighting that future studies could be undertaken that better exploit the panel properties of the BHPS

Probably the best single empirical study to date is that by Gerdtham and Johannesson (2001) that was introduced in the first part of the chapter. The authors attempted to estimate the effect of absolute income, relative income and income inequality on the risk of mortality in the municipalities of Sweden using the Survey of Living Conditions (ULF). In order to do this, Gerdtham and Johannesson estimated mortality risk as a function of individual income, community income and community income inequality. The relationship between individual income and mortality risk was established in the last section. Here, we describe the effects of community income and community income inequality on mortality risk.

In general the authors found no significant effect of mean community income on mortality. The exception to this result arose when the community was defined on the county level rather than on the municipality level (as in the baseline analysis). The mean county income was significant with a negative sign, implying that a higher county mean income has a protective effect. This is, however, contrary to the relative income hypotheses, whereby, at its simplest level, individual health depends on the deviation of the individual's income from the population mean income. Therefore if everyone apart from individual i sees their income rising, individual i's health will worsen. On the other hand, it is not implausible that a high average community income could have a protective effect on health. Community income could be associated with a number of factors with potential health effects, such as the provision of public goods, environmental quality, and access to health care. The authors would prefer to control for these community characteristics in testing the relative income hypothesis.

No significant effect of community income inequality was found. The Gini coefficient had a negative sign, and was non-significant. This result was stable in a large range of sensitivity analyses (including the re-estimation of results using Robin Hood index, the income share of the 50 per cent poorest individuals, the variance of income and the coefficient of variation in income). Overall, the results were consistent with the absolute income hypothesis, whereas the authors failed to confirm the relative income hypothesis and the income inequality hypothesis.

In our view these are very important findings, but the authors themselves draw attention to potential weaknesses that ought to be acknowledged. For example, although there is a relatively large sample and long follow-up period, the statistical power to detect effects of the mean municipality income and the municipality Gini coefficient is less than the statistical power to detect an effect of individual income (because there is greater variation in individual income than in the mean municipality income and income inequality). The geographical variations in income are relatively small in Sweden, and even larger sample sizes may be needed to detect the effects of community income and income inequality. Another limitation the authors identify is the assumption that relative income and income inequality are important at the community level, but the most appropriate 'community' may not have been defined. It could also be the case that it is the relative income and income inequality for the country rather than the community that is important for health, and this could not be tested here. Furthermore, the relevant reference group to define relative income may not be individuals who live in the same area; the relevant reference group could consist of members of the same occupational or educational group.

Postscript

Part of the difficulty from an empirical perspective is that very few studies have constructed a good enough measure of relative income at an individual level to adequately test the hypothesis that the psychosocial effects of being relatively worse off compared to a reference group have adverse health consequences. Inserting a measure of average community income into regressions on health outcomes after adjusting for individual incomes and income inequality may not capture this idea adequately. However, the latest work of which we are aware tries to address these limitations. Eibner and Evans (2001) use individual level data, a sophisticated measure of relative income (income relative to mean income), and four different reference groups. Their initial results reveal significant relationships between relative income (or deprivation as they refer to it), poor health habits and mortality. The authors themselves admit that their results are only suggestive of a causal link between relative income and poor health and could simply reflect a statistical correlation. However, we recognise the potential importance of Eibner and Evans' wider work in exploring issues of relative deprivation and recommend that close attention should be paid to their future work. Their plans have been made available at
http://www.russellsage.org/special_interest/social_inequality.htm#top .

Summary

What does all of this literature add up to? We begin by summarising the views of Wagstaff and Van Doorslaer (2000) and Deaton (2001), and then add our own conclusions.

Wagstaff and van Doorslaer (2000) make the very important point that 'a large number of studies have been undertaken that … appear to be incapable of shedding any light on the effects of relative income and income inequality on individual health' (p. 565). The main reason for this is that if there is a nonlinear association between income and health – which is generally accepted to be the case – then one would expect to find an association between average measures of health and indicators of income inequality at the population level. But this would not in itself provide evidence of the income inequality hypothesis. To test this proposition one needs at a minimum to combine information about income and health at the individual level with indicators of income inequality at a community level. Wagstaff and van Doorslaer point out that only a very small number of studies that satisfy these criteria – all based on US data - were available at the time of their review and all of them had technical or methodological problems of one kind or another.

Nevertheless, they felt able to draw some tentative but persuasive conclusions. They do find that some of the better-designed studies contain some evidence in support of the income inequality hypothesis. However, they caution that:

… the strength of the effect depends crucially on how well one controls for other influences on health, especially the individual's income and those that are hard to measure but vary systematically from state to state … When such influences are controlled for … the evidence at the population level appears to disappear. Some weak evidence remains … for the poorest section of the population … (but this implies) *that income inequality may not be capturing the hypothesised effects of social capital or psychosocial factors but rather the effects of state-level policies towards the poor that are correlated with income inequality* (p. 564).

Deaton (2001) stresses that much of the international literature needs to be treated sceptically, if only because of the low quality of much of the data on income distribution, and points out that better data, or at least more consistent data, is available within countries. Some of the most interesting evidence on inequality and health comes from studies looking across areas within developed countries, such as Britain, Canada, and the US, and in a few

poor countries. Following his review of evidence from studies that link individual mortality and morbidity to the ambient level of income inequality, he concludes:

It is not true that income inequality is a major determinant of population health. There is no robust correlation between life-expectancy and income inequality among the rich countries, and the correlation across the states and cities is almost certainly the result of something that is correlated with income inequality, but that is not income inequality itself (p.60).

He points out that the rapid increases in income inequality in the 1980s have not been associated with any slowdown in the rate of mortality decline. Studies of individual mortality and income inequality show no link, except for one survey where the estimated effects are small and are confined to one population group (Soobader and LeClere 2000). Deaton adds that his own conclusions are not different from those previously articulated by Judge (1995), Judge et al (1998) and Van Doorslaer and Wagstaff (2000).

Our overall view is that the latest contributions to the debate about income inequality and health tend to support the central views expressed by both Wagstaff and van Doorslaer (2000) and Deaton (2001). Despite the huge number of studies that have been published there is no really convincing evidence that income inequality has an independent effect on health after properly controlling for individual influences on health including income and other contextual factors at the area level that reflect the neo-material circumstances of the area. In part this is because the data requirements to conduct a convincing analysis are formidable. Even so we believe that the most convincing reviews of the published evidence to date point in the following directions. First, that at the very least a substantial part of the observed aggregate association between measures of population health and indicators of income inequality is a function of the individual-level non-linear relationship between income and health. The second major conclusion is that insofar as there is a residual association between income inequality and health it is best interpreted as a marker for a wider set of socio-economic and political circumstances and processes that impact on health.

The focus of future work should concentrate on developing a better understanding of the relationship between poverty and health at the individual or family level. In particular, we need to focus on clear definitions and construct empirical multilevel tests to learn more about the effect that relative deprivation/poverty/income has on health outcomes, along the lines of the current research being undertaken by Eibner and Evans. There appears to be very little to be gained by the production of yet more analyses of the barely discernible relationship between income inequality and health after adjusting for individual income and other factors. If poverty is properly addressed as a determinant of health, then income inequality per se should not be a concern for health policy makers.

Chapter Four: New Zealand in Context

Having considered some important conceptual and methodological issues that should inform any investigation of the relationships between poverty, income inequality and health, and having reviewed some of the most significant empirical findings in the international literature, we now turn our attention to recent findings from New Zealand. Chapter 3 of *Social Inequalities in Health: New Zealand 1999* (O'Dea and Howden-Chapman, 2000) explores the links between income and income inequality and health. It is based on two main analyses: the first – based on data about individuals and households - links household income to health outcomes, risks and service utilisation. The second is an analysis of data for 27 regions of New Zealand linking average income and the distribution of income with mortality and hospitalisation. We restrict ourselves to a review of the links with health and do not consider the use of health services.

Low Income and Health in New Zealand

In the first analysis, individual respondents under the age of 65 are classified into equivalent gross household income quintiles and prevalence rates or average values on a number of health-related outcomes (smoking, alcohol, obesity, asthma, high blood pressure, subjective health status and SF-36 scores) are compared across income quintiles

Table 3: Excellent or very good self-reported health status by gender and quintile group

Household income quintiles					
Gender	1 (poorest)	2	3	4	5 (richest)
Females	53.2	50.0	59.5	66.8	73.7
Males	48.5	51.1	62.1	64.8	67.9

Source: Howden-Chapman & Tobias, 2000, Table A3.3

For example, the results shown in Table A3.3 (Howden-Chapman and Tobias, 2000, p.177), some of which are reproduced in Table 3 above, show the marked differences in the percentage of people reporting their own health as excellent or very good varies from 67.9 per cent to 73.7 per cent for the richest men and women in the top income quintile to between 48.5 per cent and 53.2 per cent for the poorest men and women in the bottom income quintile. This relatively simple type of bivariate analysis based on cross-sectional data is not especially powerful taken in isolation. However, the findings are consistent with many other studies reported in the international literature. For example, the authors refer to the Australian National Health Strategy report (National Health Strategy, 1992) and a study by McDonough et al (1997) to support the view that:

The level of absolute and relative income in society has both a direct effect on individuals' health – through enabling people to pay for adequate food, appropriate housing and private health care – and also an indirect effect, through psychosocial mechanisms (p. 83).

However, O'Dea and Howden-Chapman also acknowledge that the 'mechanisms underlying the association between income level and health status are not well established' (p. 65), in part because much of the existing research is based on cross-sectional data.

It should be noted, however, that although the survey used for the individual level analysis has a response rate of 73.8 per cent it seems that only 81.2 per cent of respondents

answered the questions about income. Initially we were concerned about this not least because the report itself concludes that the income data in the 1996-7 New Zealand Health Survey 'are sub-optimal' (p. 172). However, we have been reassured (private correspondence) that while the income data are not ideal they do provide a reasonable source of data for the purpose. Overall, we are satisfied that the results reported by O'Dea and Howden-Chapman are very much in line with what we would have expected to see. There is every reason to believe that low incomes are associated with adverse health outcomes in New Zealand as elsewhere.

Income Inequality and Health in New Zealand

The second set of analyses presented in the report are based on multiple regression analysis of regional data. Two sets of variables are of particular importance. Health status is measured by standardised mortality ratios (SMRs) averaged over the five-year period 1990-1994. Average income and a measure of income inequality (the Gini coefficient) were calculated for each region using data from the 1996 Census. These estimates were equivalised to take account of differences in household composition and age standardised.

The first result, which seems reasonably uncontroversial, is that average income on its own accounts for 37 per cent of the observed variation in mortality rates. When income inequality is added to the statistical model the proportion of the variation that is accounted for increases to 46 per cent and both variables are statistically significant at the 95 per cent level. However, there appears to be some sensitivity in the results to outlier observations

Overall the authors conclude that:

Poor health outcomes and health risk factors are associated with low household incomes … Our data also tentatively suggest that there is a link between the health of individuals and the income inequality of the community in which they live (p. 85).

The authors note that 'these results should be regarded as preliminary' not least because of the possibility that some of 'the association between income inequality and health outcomes is connected with differences in ethnic composition of regional populations' (p. 82). This appears to be a reasonable conclusion on the basis of the reported findings. However, perhaps more should have been made of the apparent links between ethnicity and income inequality.

We also have some additional concerns. It seems rather odd that measures of income and income distribution in 1996 are compared with SMRs for several years earlier. No explanation is given for this but presumably the underlying assumption is that income distribution was relatively stable during the 1990s and that 1996 data would have reflected the position at the time that deaths were recorded. But this does not seem to be borne out by examination of Figure 3.1 (O'Dea and Howden-Chapman, 2000, p. 66), which shows a continuing increase in inequality in the distribution of income during the first half of the 1990s. For example, although the path was not a linear one, the Gini coefficient seems to have increased by about 10 per cent after 1990. We also note that there are significant differences in Census response rates to the income question that differ appreciably by ethnic group. For example, only 62 per cent of Pacific Islanders and 75 per cent of Maori people provided information compared with 88 per cent of people who describe themselves as European. We would have liked to know more about the extent to which these differences might have biased the results.

Replication and Re-analysis

It is not part of our brief to carry out new statistical analyses but thanks to the generosity of the authors who have provided their raw data we have undertaken an approximate replication of the analyses of the relationship between income, income inequality and SMRs for the 27 Health Funding Authority (HFA) regions. Despite some differences in the precise method of computation – using SPSS and taking the actual values rather than logs - it was not difficult to reproduce the broad pattern of results reported by O'Dea and Howden-Chapman. For example, we found that average household income accounted for about 35 per cent of the observed variation in SMRs and that the adjusted R^2 increased to 0.43 when the Gini coefficient was added to the statistical models, and that both variables were statistically significant at the 95 per cent level. However, combining average income with the proportion of the population recorded as Maori produced better statistical results by conventional criteria. In this case the adjusted R^2 was 0.52, with both of the included variables again being statistically significant at 95 per cent.

As O'Dea & Howden-Chapman (2000) clearly acknowledge there are some difficult problems of interpretation involved here and they note that: 'Further work is needed on the influence of ethnicity on the relationship between regional income variables and regional health outcomes' (p. 82). It should also be noted that Woodward et al (2000) report that 'whatever measures are used to adjust for poverty, disease rates are higher amongst Maori' (p. 67).

Given these statements we are somewhat surprised that O'Dea & Howden-Chapman conclude in favour of 'the hypothesis of relative income having an effect on health outcomes independent of absolute income' (p.84). To us the strength of the relationship that emerges from the data that are available is at best a tenuous one.

Of course, it is perfectly **possible** that the dispersion of incomes between households within an area may have an effect on health that is independent of the distribution of average income between areas. However, it is clear on the basis of the evidence presented that absolute levels of income have the strongest and most consistent associations with variations in mortality and in this respect such findings tend to confirm the view that absolute variations between areas in levels of deprivation have the strongest links with health outcomes.

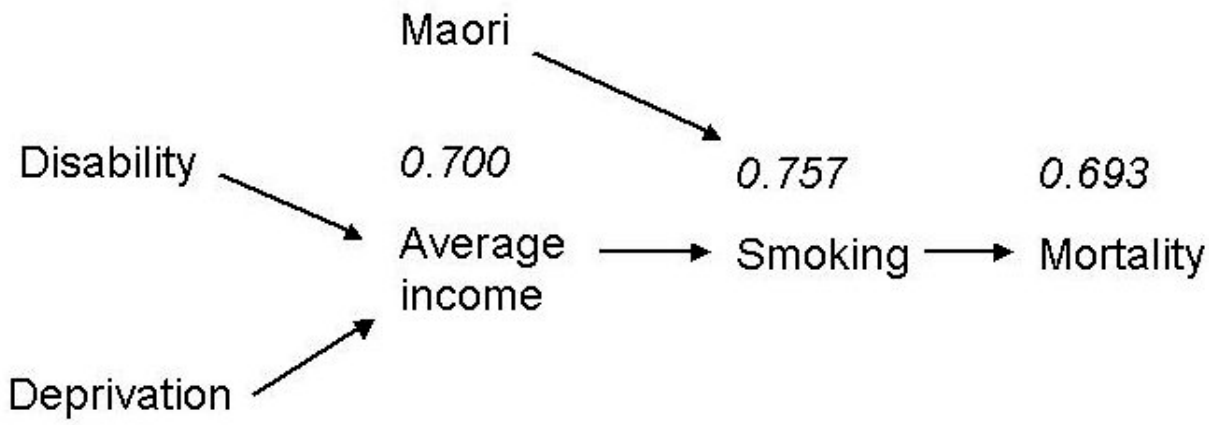
From this perspective it is worth noting some simple bivariate correlations between the various indicators set out in Table 4. Two sets of results are particularly striking. The first are the very strong links between the average level of deprivation, the proportion of the population recorded as Maori and mortality rates. The second is the absence of a significant bivariate relationship between income inequality and mortality, although the Gini coefficient is significantly correlated with deprivation and Maori. In our view these simple findings add weight to the need for caution in assuming that income inequality at the level of an HFA region has an independent effect on health outcomes such as regional variations in mortality.

Our conviction that the findings about the postulated relationship between income inequality and mortality in New Zealand are not to be taken at face value is given further weight by examining some additional data from the 1996 Census provided by *Statistics New Zealand*. Table 4 also shows the relationship between a number of regional characteristics and mortality not included in any part of the report by Howden-Chapman and Tobias (2000). For example, the proportion of people in each HFA region who are single parents or smokers or unemployed or who have disabilities are all statistically significantly associated with variations in mortality rates.

Now we concede immediately that making sense of these kinds of data in such a way that provides a really convincing explanatory model of differences in mortality is not a simple task.

But we believe that Figure 2 below has at least as much face plausibility and considerably greater statistical power than the statistical models reported by O'Dea and Howden-Chapman. The simple model shown, which is based on a series of simple OLS regression models, sets out a stylised framework that suggests that 69 per cent of the variation in SMRs is related to differences in smoking. In turn 76 per cent of differences in smoking rates can be accounted for by variations in (a) average levels of income and (b) percentage of Maori. In its turn 70 per cent of variation in average income is related to disability and deprivation. Given our distance and lack of detailed knowledge about the social determinants of health in New Zealand these comments and illustrations are meant to provide no more than food for thought, but we believe that they do represent a serious challenge to the proposition that income inequality is a serious determinant of regional health inequalities in New Zealand.

Figure 2: Illustrative determinants of regional variations in mortality in New Zealand



Nevertheless, whatever the pros and cons of their regional analysis of income inequality and mortality in New Zealand, O'Dea & Howden-Chapman acknowledge that the 'claim that relative income is an important determinant of health inequality has not gone unchallenged' (p.84). They summarise a number of contributions (Judge, 1995; Kawachi & Kennedy, 1997; Gravelle, 1998; Wolfson et al, 1999; Fiscella & Franks, 1997; Kennedy et al, 1998) from the recent international literature on this topic and conclude that 'the debate is not yet concluded' (p. 84). This statement seems perfectly fair in light of the debate set out in the previous section.

Two points stand out from this review in the context of the work on income and health reported in *Social Inequalities in Health: New Zealand 1999*. The first is that O'Dea and Howden-Chapman (2000) are almost certainly on solid ground in highlighting some of the associations that they have identified. Their conclusion that 'poor health outcomes and health risk factors are associated with low household incomes' (p. 85) is well supported by the international literature. The second is that there is real merit in encouraging public bodies in New Zealand to invest in data sources that will permit investigation of the relationship between income and health over time. As the authors rightly point out, it would be 'desirable to institute longitudinal studies, monitoring the health status and other characteristics of selected cohorts (panels) of respondents over long periods of time' (p.86)

As we have made clear, we are much less convinced about the inferences made by O'Dea and Howden-Chapman (2000) about income inequality and health. One key problem is the extent of multicollinearlity among possible social determinants of health including income inequality. If the relationship in New Zealand comes not from the effects of income inequality

per se, but some other factors that are correlated with it, this would come as no surprise as it would be consistent with the findings of the most recent international evidence reported in the last section. For example, Deaton and Lubotsky (2001) showed that, once the fraction of the population that is black was controlled for, there was no relationship between income inequality and mortality across either states or cities in the US. Ross et al (2000) found no significant relationship between income inequality and mortality at either provincial or metropolitan area level in Canada, while Gerdtham and Johannesson (2001) found no significant effect of community-income inequality on health in Sweden either.

It is very important, especially in the context of the New Zealand experience, to acknowledge the strength of the interaction between race and income inequality found in the US by Deaton & Lubotsky (2001). This is an issue that merits close attention but which goes well beyond the remit of this review. One unambiguous fact drawn from the New Zealand data however is the poverty of the Maori. Being Maori was strongly correlated with deprivation, unemployment, being a single parent and being a smoker. While we are in no position to spell out specific strategies to tackle poverty among the Maori, it is clear that the real issue for social exclusion in New Zealand is ethnic disparities. To the best of our knowledge this problem is already high on the policy agenda in New Zealand and needs no further comment by us.

Table 4: Correlations between selected characteristics of HFA regions in New Zealand

Regional characteristics	Income	Gini	Deprivation	SMR	Maori	Single parent	Smoker	Unemployed	Disabled
Average Income	-	.274	-.528*	-.610*	-.346	-.309	-.618*	-.137	-.820*
Gini Coefficient	.274	-	.500*	.144	.525*	.434	.225	.534*	-.325
Index of Deprivation	-.528*	.500*	-	.772*	.878*	.877*	.823*	.825*	.401
SMR	-.610*	.144	.772*	-	.616*	.620*	.840*	.545*	.523*
Maori	-.346	.525*	.878*	.616*	-	.901*	.803*	.828*	.142
Single parent	-.309	.434	.877*	.620*	.901*	-	.710*	.886*	.163
Smoker	-.618*	.225	.823*	.840*	.803*	.710*	-	.567*	.440
Unemployed	-.137	.534*	.825*	.545*	.828*	.886*	.567*	-	.075
Disabled	-.820*	-.325	.401	.523*	.142	.163	.440	.075	-

* Correlation is significant at the 0.01 level (2-tailed)

Chapter Five: Policy Implications

As part of this review we have been asked *to comment on the relative contribution that income/wealth inequalities make to the dispersion in health outcomes relative to other potential causal contributors*. This is an almost impossible task, certainly in the relatively small amount of time that we had available to undertake this commission. To the best of our knowledge, despite the vast number of recent enquiries and studies investigating the causes of health inequalities and the policy implications associated with reducing them, there is no clear message available anywhere that would provide unambiguous guidance to policymakers. When MacIntyre and colleagues (2001) were invited to form an evaluation group to assist the independent Acheson inquiry into inequalities in health in 1997, they were 'struck by the lack of empirical evidence available for a government to base policies or decide priorities, despite the large amount of research undertaken and published on the subject in the United Kingdom' (p.224). They were further concerned by the readiness of researchers to recommend policies the effectiveness of which they knew little about, in contrast to their caution in interpreting the results of epidemiological or clinical evidence. We share these views.

Nevertheless, we do not mean to imply in any way whatsoever that there are not many publications well worth close scrutiny and that have much to offer by way of analysis and evidence that ought to inform and underpin policy development. Restricting ourselves to those general studies published in the past two or three years only we would particularly commend the following as being especially worthy of attention: Acheson (1998), Adler et al (1999), Auerbach & Krimgold (2001), Graham (2000), Marmot & Wilkinson (1999) and Shaw et al (1999).

In general the studies cited above and many others like them are likely to support the views expressed recently by Hilary Graham (2000b) that:

… socio-economic inequality is made up of an intricate web of hierarchies which individuals negotiate as they journey from childhood through adolescence and into adult life. Focusing on one thread in this web – on current occupation, for example – can obscure how health is shaped by a broader range of influences which run back to the early years of life … (which implies) *that health inequalities are the outcome of cumulative differential exposure to adverse material conditions and to behavioural and psychosocial risks* (pp. 4-5 & 15).

A key feature of the recent literature is its emphasis on lifecourse perspectives. Poverty and disadvantage can be damaging at any stage in life but they are especially harmful when experienced in early life. For example, Benzeval et al (2000c) have shown quite clearly the enduring importance of childhood poverty for health capital and educational attainment, and the additional health-damaging consequences of low income in adulthood. The results suggest that practical policies to reduce poverty, especially for families with children, should be an essential ingredient in any concerted effort to tackle health inequalities. However, they point out that the statistical importance of the poverty variables in their analyses is reduced when other factors – particularly education, employment and parent's circumstances, which are themselves associated with poverty – are introduced into the models. What this means is that alongside direct measures to alleviate poverty other policy developments are also required: to promote educational opportunities; to provide support for parents; to reduce the harmful consequences of marital breakdown; and to promote employment opportunities. It seems reasonably clear that persistent poverty is bad for health especially when it begins in childhood. But is very difficult to say clearly on any scientific basis which of numerous policy options is more important than the others in the fight against poverty because to do so requires value judgements to be introduced.

Perhaps the safest thing to say is that where income inequalities are most marked and the proportion of the population that experiences poverty is particularly high then no strategy to reduce health inequalities is likely to succeed unless it acts directly to improve the material circumstances of those individuals and families who are worst off.

We have already made it abundantly clear that we believe that the importance of income inequality per se as a determinant of population health has been greatly exaggerated. But we cannot rule out the possibility that it might have an impact especially in the most inegalitarian societies. However, we need to remember the broader literature that has analysed the social determinants of health inequalities.

As Graham (2000b) reminds us: 'Statistical advances, like multi-level modelling, are enabling researchers to locate individuals in the areas in which they live and to measure the contribution which people and places make to health inequalities' (p. 16). Joshi and colleagues (2000) have attempted to do precisely that by asking the question: what matters most, people or places? They conclude that:

Both do. Our analyses … produced a remarkably consistent set of findings about the contribution of context and composition to area differences in health. Area differences in self-reported ill-health … are mainly, but not simply, attributable to the socio-economic characteristics, occupational and migrational histories of individual residents. But where people live also matters (p. 152).

This chimes in well with the observations of Kaplan that in the USA the 'social and economic properties of communities are independent predictors of the health of individuals who live there' (2001, p. 142). But there are two important implications of these studies for the income inequality hypothesis. The first is that even though places might matter the particular circumstances of individual people are more important. Secondly, income inequality per se is only one of many competing characteristics of communities that might be implicated as area level determinants of health. We conclude from this that income inequality per se cannot be that important and this is confirmed in our view by the emerging findings from the best of the recent empirical studies.

Having said this we acknowledge that not everyone will be convinced partly because much of the debate about income inequality and health seems to be 'driven more by ideology than science, so that there is a rush to judgement on both sides' (Smith, 1999, pp. 163-4). Unfortunately, it looks as though for the foreseeable future policymakers will have to place greater reliance on judgement than on evidence given the relative paucity of the latter. As a contribution to the consideration of judgements that have to be made we set out some of our views below

After reviewing many studies that proffer advice about how to tackle health inequalities the one that we find ourselves most in agreement with in general terms is that articulated by Kaplan (2001) who argues that even though 'there is no single solution to the problem of inequalities in health … the available evidence … points to strategic areas for action'.

We do not agree with all of the priorities identified by Kaplan. For example, he places a much greater emphasis on income inequality than we believe is justified by the evidence. Nevertheless, we do believe that any concerted attempt to reduce health inequalities does require action at a number of different levels and in different sectors. For example, we think that the links between individual poverty, community deprivation and poor health are sufficiently well established to justify a range of measures to reduce the prevalence of low income and worklessness among adults, to tackle child poverty and to regenerate disadvantaged neighbourhoods. At the same time, although policies outside the health sector

are likely to have greatest impact on health inequalities, improving access to appropriate and effective health services also has a contribution to make. We provide a brief illustration of some of the ways in which these strategies can be developed in practice by outlining some examples of policy initiatives within the UK that seem to be particularly relevant to a review of poverty, income inequality and health.

Active Employment Policies

The UK government is acting on the basis that the most effective way to tackle poverty is to introduce policies focused on getting people into work or increasing the incomes of those already in work. Indeed, the central theme of the government's welfare reform is 'work for those who can; security for those who cannot' (DSS, 1998). For example, a range of policies - such as New Deal for the Unemployed, the National Minimum Wage and Working Families Tax Credit - have been introduced to reduce barriers to employment.

The government's single biggest investment is to promote a range of New Deal initiatives to promote employment for a number of different groups. The main focus has been on young people who have been employed for six months and people over 25 who have been unemployed for two years. The key determinant of the success of initiatives such as the New Deal is whether providing people with short-term employment opportunities, through subsidising jobs or developing special employment schemes, increases their long-run effectiveness at work and hence employability (Bell et al, 1999). It is still too early to assess the overall impact of the New Deal programme, although Bell et al simulated the effects of the initiative using a cohort in the Labour Force Survey prior to its introduction. For young people who are unemployed for 6-12 months, 41 per cent find employment in the following six months without the New Deal, although 64 per cent of those are unemployed again within another six months. Many of those who find jobs during the New Deal gateway period, therefore, would have found employment anyway, representing a large deadweight cost for the scheme. At the same time, the simulation shows that experiencing six months employment will not necessarily promote long-term employability. Bell et al (1999) conclude that 'the productivity effects are relatively modest compared to the size of the subsidy deemed necessary to get the groups into jobs. Thus it is likely that the effects of the policy will be far more modest than its proponents have hoped for' (p.37).

Establishment of the minimum wage is an important advance, with the low pay network having had success in getting minimum wages back onto the trade union and public agenda. Introduced in April 1999, the rate was set rather modestly at £3 per hour for people aged 18 to 21 and £3.60 for others, and will soon rise to £3.50 and £4.10 respectively. However limited, the minimum wage should encourage a stronger challenge to in-work deprivation and could float people off dependency on social security. The government has also increased in-work income for low-paid workers by making the Working Families' Tax Credit (WFTC) more generous that its predecessor, Family Credit. Finally, the government has introduced a new 10p income tax rate and reformed the National Insurance system by raising the threshold and removing the 'entry fee' to reduce the burden on those in low-paid jobs.

The extent to which these policy changes encourage individuals back into the labour market or reduce low income among workers is open to question. Gregg et al (1999) also used Labour Force Survey data to simulate the effects of WFTC, the 10p tax rate and the reforms to the National Insurance system on income and unemployment levels. Their analysis suggested that all the policies will increase average in-work income, the changes in the National Insurance system would have the biggest effect on unemployment levels, the WFTC would be the best value for money, while the 10p income tax rate would be the most expensive. In a separate analysis, the pattern of WFTC claims between August 1999 and August 2000 has been examined to investigate how far in-work benefits bring particular

advantage to high unemployment areas, get significant numbers of people into work and address child poverty (Webster, 2001). During this period, WFTC has increased the proportion of lone parents receiving a credit by under 7 per cent in disadvantaged areas – where lone parents are concentrated – as against about 14 per cent in prosperous areas. Webster's findings reinforce Blundell et al's (2000) earlier indications that WFTC is mainly going to people already in work, and the policy has had limited effectiveness in addressing child poverty. It remains clear that the majority of those living on very low incomes in the UK are not in work and could not take on work because they are caring for children and other dependents or are over retirement age. The most destitute of families continue to require benefits assistance.

Tackling Child Poverty

Child poverty is now at the centre of the UK government's social inclusion strategy. The government has made education their 'number one priority because without skills and knowledge children will not succeed in life' (Blair, 1999). For pre-school children, the government has introduced Sure Start in 60 disadvantaged areas across the country, which provides additional resources to promote early education, health and family support services. In addition, Education Action Zones have been established in 25 deprived areas to provide added impetus to efforts to enhance learning opportunities.

In successive Budgets, on top of the in-work tax and benefit changes described above, the government has increased the rate of universal child benefit and the child element of income-related benefits, as well as introducing a tapered Child Tax Credit. The increases in the income support scales for children – an increase of 16 per cent since autumn 2000 – are viewed in some quarters as one of the most important social policy acts under the current Labour administration. Prior to 1999, scale rates for children had been increased since 1980 more or less in line with price inflation. This was one of the most important reasons for the huge increase in child poverty and inequality that the UK has experienced over the last 20 years. Around one in five children in Britain is living in families dependent on income support (or income tested jobseeker's allowance) yet until 1999, Labour had done very little to improve their living standards. Indeed, by abolishing the lone parent premium in income support (for new claimants) it had in effect cut their living standards. The Family Budget Unit (FBU) estimated in January 1998 that a couple with two children under 11 needed £154.04 per week to achieve a low-cost but adequate standard of living. Income support at that time paid £121.75 – a shortfall of £23.29. The gap is now £11.17.

Bringing all of the 'welfare to work' and child poverty measures together, the government estimates that they will have lifted 700,000 children out of poverty by 2002 and that it will take 20 years to eradicate child poverty altogether (Blair, 1999). In a detailed assessment of these policy changes, Piachaud (1999) confirms that the government should achieve its first target, but that they are unlikely to meet their longer-term goals without further substantial increases in benefit levels.

Health Inequalities Targets

Whatever the eventual impact of policies to reduce poverty and worklessness on health inequalities in the UK there can be no doubt about the extent of the political commitment across government to tackling this aspect of social exclusion. One manifestation of the importance attached to this problem is that, for the first time ever, local targets for reducing health inequalities are to be reinforced by the creation of national health inequalities targets.

1. Starting with children under one year, by 2010 to reduce by at least 10 per cent the gap in mortality between manual groups and the population as a whole.

2. Starting with Health Authorities, by 2010 to reduce by at least 10 per cent the gap between the quintile of areas with the lowest life expectancy at birth and the population as a whole.

These targets complement others that have been set with an inequalities focus, such as in the areas of smoking and teenage pregnancy. Taken together, they are intended to reflect efforts to reduce the broad spectrum of inequalities and will be monitored on an annual basis. At the same time there is a very broad recognition that much more needs to be done to learn about and to promote action at all levels and across all sectors that might in combination facilitate progress towards these health inequalities targets.

In the meantime, it is worth noting the more elaborate approach to setting health inequalities targets that has been adopted in Sweden. The National Public Health Committee in Sweden has provided a blueprint for a strategy that explicitly recognises the social determinants of health inequalities. Entitled *Health on equal terms- national targets for the population's health* (2001), the document sets targets for reductions not in disease and injury, but in exposure to their social determinants. The Committee was commissioned by the Swedish Government to develop national public health goals and strategies for attaining the goals. It proposes 17 health policy goals that might be achieved by 2010, which are grouped into the following categories:

1. Strengthening social capital,
2. Growing-up in a satisfactory environment
3. Improving conditions at work
4. Creating a satisfactory physical environment
5. Stimulating health-promoting life habits
6. Developing a satisfactory infrastructure for health issues

All proposed targets are developed and formulated from a *health determinant perspective*. A number of targets are linked to each goal and the Committee has also defined the target groups and chosen the public body to be responsible for their implementation. In principal, the responsibility for implementation is proposed to be integrated in the remit of national agencies and their sectoral missions. A strong co-ordination for public health within the Cabinet is also proposed. For regional and local authorities, as well as commerce and the voluntary sector, a number of different actions are defined as 'challenges'. The full list of 17 goals and component targets are presented in Figure 3 (pp 73-75).

Conclusion

Having carefully reviewed the most important and recent empirical studies of income inequality and health, we conclude that the relative effect of income inequality per se as a determinant of population health has been greatly exaggerated. There is a growing body of evidence from the new generation of multi-level studies that the frequently observed association between income inequality and population health at the regional level, especially in the USA, is a by-product of two factors. First, the non-linear relationship between individual income and health, which means that poverty is strongly associated with adverse health outcomes. Secondly, the fact that income inequality may act as a marker for other area characteristics such as ethnicity or the extent of social welfare infrastructure that do influence health. The relative importance of these two factors is not absolutely certain but the first seems more significant than the second.

We believe these are robust conclusions, but – as the best studies acknowledge – there is scope for further work. One of the problems that the empirical literature has struggled with in recent years is that conjecture and theory have greatly outdistanced the availability of data to test them adequately. For example, Kaplan and Lynch (2001) contend that we are not yet at the point where we can investigate 'with nuance and depth, the links between neomaterial conditions and the forces that generate them, psychosocial states, the social milieu, and health outcomes' and until we can 'we are not likely to be able to understand much more about the links between income inequality and health' (p. 352). There is much truth in the first part of this observation, but we remain reasonably convinced on the basis of present knowledge that there is no good empirical evidence that would justify action to reduce income inequality per se – as distinct from the poverty that is often associated with income inequality – on the basis that it would improve population health.

We are more convinced that health inequalities are the outcome of cumulative differentials in exposures to poor material conditions – including low income – and resultant behavioural and biological risk factors, which can endure throughout the lifecourse. Policymakers therefore face the challenge of addressing these multiple exposures and behavioural factors without losing sight of the importance of their time dimensions. Investing heavily in a single-strand policy to tackle a temporary condition such as current unemployment can obscure how health has been shaped by a broad range of influences that have accumulated since childhood.

The overview of lifecourse studies presented in chapter 2 has clearly demonstrated that financial circumstances in childhood are an important determinant of an individual's educational attainment and health capital as they enter adulthood. These, in turn, have a significant effect on people's living standards and health in adulthood, and low incomes then also have a detrimental effect on health. The introduction of a range of policies to improve living standards by creating opportunities for employment and education as well as reforming the benefit system are obviously important in tackling poverty and health inequalities, but so too are those which address housing, access to adequate services – such as public transport, supermarkets and leisure facilities – the working environment, crime, and health-damaging behaviours such as smoking, drug and alcohol abuse and unhealthy diets. The health system also has its part to play to underpin work on reducing health inequalities, including changes to resource allocation, the performance management of local action on health inequalities, providing illness prevention and health promotion, and a more equitable distribution of GPs. The relative importance placed on each policy within the overarching strategic model is the real challenge for policymakers.

The main thrust of the UK's anti-poverty strategy emphasises, first, the central role of employment as the best route out of poverty, and second, the priority of families with

children. These are also important parts of any strategy to reduce health inequalities, even if the government has since set two national targets based specifically on health outcomes. We have included a discussion of relevant UK policy to indicate that, although the government has promoted policies to meet these objectives, they have only had marginal effects to date and are unlikely to make a major impact on unemployment, poverty levels and health inequalities in the immediate future.

Nevertheless, we welcome the fact that health inequalities are being treated as a serious issue and that some attempt is being made to address their causes. We have drawn attention to the goals and targets recently set by the Swedish government, as it is the most comprehensive strategy for reducing health inequalities yet. Not only does it give explicit recognition to the multiple social determinants of health, but sets goals for both material and psychosocial conditions, as well as for its health service. The strategy recognises the importance of the lifecourse by containing commitments to reducing child poverty and providing opportunity for life-long learning. It sets targets for mental health, sexual health, tobacco consumption and drug abuse. And it also contains commitments to improve health promotion and preventive methods at different levels of society, as well as a more co-ordinated effort on public health.

We cannot give an unambiguous guide to policymakers in New Zealand on the most appropriate strategies to reduce poverty-related health inequalities. The vast number of empirical studies investigating the causes of health inequalities and the policy implications associated with them still do not provide a particularly clear message. There is a broad consensus within the research community about the multifaceted nature of the social determinants of health inequalities but remarkably little evidence about the extent to which investments in specific policy instruments will yield precise benefits in terms of health inequalities in general. Nevertheless, determined efforts are now being made in a number of countries to strengthen the evidence-base so as to better guide policymakers who are committed to tackling health inequalities (Whitehead, 1999).

Figure 3: Goals and targets to reduce health inequalities in Sweden by 2010

A strong sense of solidarity and feeling of community in society

- Reduced poverty
- Reduced segregation in housing
- Compensatory resources for children and young people in socially-disadvantaged housing areas

A supportive social environment for the individual

- Reduced isolation, loneliness and insecurity
- Increased participation in leisure and cultural activities

Safe and equal conditions in childhood for all children

- A secure bond between children and their parents
- A nursery and school system which promotes health by strengthening pupils' self-confidence and achievements at school
- Improved mental health amongst children and young people

A high level of employment

- Opportunity for life-long learning
- Low unemployment
- No discrimination against immigrants or the disabled in the labour market

A healthy working environment

- Adaption of the physical and mental demands of work to meet the requirements of the individual
- Increased influence and opportunities for development at work
- Reduced overtime

Accessible green areas for recreation

- Quiet and safe green areas near residential housing
- Stimulating playgrounds at nurseries and schools
- Good outdoor facilities near sheltered housing for the elderly and disabled

A healthy indoor and outdoor environment

- Reduce exposure to passive smoking
- Well-ventilated indoor environment
- A high standard of building, protection from radiation, fresh air and non-toxic environment in accordance with the proposals of the Environmental Targets Committee

Safe environments and products

- A safe home environment, a safe traffic environment and safety in other public places
- Reduced use of products hazardous to health and those causing allergies

More physical exercise

- More physical exercise at school and in connection with work
- More physical exercise in people's leisure time

Healthy eating habits

- Increase consumption of fruits and vegetables and reduced consumption of fat and sugar

- Reduced number of overweight people in society
- Increased number of women breast-feeding

Safe and confident sexuality
- Reduced spread of sexually transmitted disease
- Reduced number of unwanted pregnancies
- No one should be discriminated against because of their sexual orientation

Reduced tobacco consumption
- A tobacco-free start in life from the year 2010
- A halving up to the year 2010 of the number of young people under the age of 18 who take up smoking
- A halving up to the year 2010 of the number of smokers amongst those groups in society who smoke the most
- No one should be subjected against his will to smoking by those around him

Reduced harmful alcohol consumption
- Reduced total consumption
- Total abstinence in connection with pregnancy, driving and sailing, at work and when undertaking sporting activity
- Reduced occurrence of drinking to a state of inebriation

A drugs-free society
- Reduced access to drugs
- Reduced number of young people trying and using drugs

A more healthy-oriented health service
- More effective measures for the prevention of ill health and for health promotion on an individual, group and community level
- Increased co-ordination to insure equal development of health in the population
- Advanced methods and strategies for work on preventing illness and promoting health

A co-ordinated effort on public health
- Responsibility for health planning in the hands of district councils and county councils
- Development of co-ordinated sector strategies within the field of public health on a national level by the responsible authorities
- A co-ordination of public health issues in the Cabinet Office and the Ministries
- A regular up-date regarding national policy for public health presented to the Swedish Parliament in the form of a report on public health policy

Long-term investment in research, method development and education
- Intensified research in to the value, costs and effects of various interventions
- Improved methods for managing work on public health
- Increased investment in education in the discipline of public health

Source: *Health on equal terms- national targets for the population's health.* Final report by the National Committee for Public Health, Sweden (2001)

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